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WIEMER (H.). **Beiträge zur Rhizoctonia- und Zopfia-Krankheit an Spargel.** [Contributions to the *Rhizoctonia* and *Zopfia* disease of Asparagus.]—*Z. PflKrankh.*, l, pp. 459–472, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 21–24, pp. 412–413, 1941.]

According to information gathered by the writer on a visit to the Rhenish-Hessian asparagus-growing districts in 1935, *Rhizoctonia crocorum* [*Helicobasidium purpureum*] is widespread and its range is increasing every year. Attacks on the roots led to the total destruction of the crop. The same pathogen infects fodder beets and carrots. It is most prevalent on heavy soils.

Zopfia rhizophila [*R.A.M.*, ix, p. 621], observed on the same occasion for the first time since its discovery in 1887, was responsible for random gaps in the stand involving losses of up to 80 per cent. of the crop. Numerous black perithecia, averaging 1 mm. in diameter and containing ascospores measuring 61 to 75 by 34 to 42 μ, developed on the dead roots.

Annual Report of the (Gambia) Department of Agriculture, for the year ending 31st May, 1941.—8 pp., 1941.

On p. 3 of this report it is stated that rosette disease of groundnuts [*R.A.M.*, xx, p. 144] was again practically absent from the Gambia, the few isolated cases reported all occurring on late-planted farms.

SHAW (L.) & HEBERT (T. T.). **Copper-sulphate dusts and copper sprays give good control of Peanut leaf-spot diseases.**—Abs. in *Phytopathology*, xxxi, 8, p. 770, 1941.

Practical control of groundnut leaf spots [*Cercospora personata* and *C. arachidicola*] was consistently secured in three years' experiments [in North Carolina: *R.A.M.*, xix, p. 62] by four applications, at fortnightly intervals beginning between 1st and 10th July, of copper-sulphur dusts (5 to 20 parts of copper to 95 to 80 of sulphur) or copper-containing sprays, such as Bordeaux mixture and cuprous oxide. Treatments along these lines are stated to have produced increased yields of nuts and hay averaging 500 and 800 lb. per acre, respectively, and together worth $15 per acre, at an inclusive cost of $5 per acre.

Plant pathology.—*Adm. Rep. Dir. Agric. Ceylon, 1940*, pp. D5–D6, 1941.

During the period under review [cf. *R.A.M.*, xx, p. 290], single-plant selections of local (Talatuoya) tomato material were shown by tests at the Peradeniya Experiment Station to be significantly more resistant to bacterial wilt [*Bacterium solanacearum*] than three varieties imported from Australia, viz., Burwood Wonder, Excelsior, and Early Dwarf Red.

Vermicularia [*Colletotrichum*] *curcumae* [ibid., xi, p. 545] caused a leaf disease of turmeric grown from rhizomes imported from India. The fungus, not previously recorded in Ceylon, may very well have been present on the surfaces of the rhizomes before planting. Severely affected foliage was excised, and the plants sprayed with a copper fungicide.

A species of *Helminthosporium* was reported for the first time on Napier grass [*Pennisetum purpureum*: cf. ibid., xx, p. 426] in an up-country district.

Surat ginger plants raised from stock free from disease [*Pythium myriotylum*: ibid., xx, p. 290] in the laboratory compound have made luxuriant growth and continue to be healthy.

Belgrave (W. N. C.). **Report on agriculture in Malaya for the year 1940.**—14 pp., 1941.

In the section of this report [cf. *R.A.M.*, xix, p. 72; xx, p. 7] dealing with plant diseases (pp. 8–9) it is stated that observations on the stems of oil palms felled and allowed to die on the surface in a replanted area showed that most were still quite sound after four years. Replanting by felling and mounding to the crowns resulted in the palms making good progress, whereas the stems of some unmounded palms decayed as a sequel to infection by *Fomes noxius*.

Dwarf coco-nut palms showed leaf disease due to *Marasmius palmivorus* [ibid., xvii, p. 162].

Annual Report of the Director of Plant Industry, Commonwealth of the Philippines, for the year ending December 31, 1938.—221 pp., 29 pl., 1940. **Semi annual Report for the period from January 1 to June 30, 1939.**—220 pp., 25 pl., 1940.

Among the items of interest in the phytopathological sections of these reports (pp. 92–101 in the first and pp. 73–78 in the second) may be mentioned the following. Since May, 1937, a vigorous campaign for the eradication of abaca [*Musa textilis*] bunchy top [*R.A.M.*, xviii, p. 444], mosaic [ibid., xx, p. 465] and vascular wilt [*Fusarium oxysporum* var. *cubense*: ibid., xix, p. 707] has been in progress in Davao. Observations on 7,900 rootstocks of the bunchy top-resistant Putian variety in eleven localities in Cavite, Laguna, and Mindoro indicated that it may safely be cultivated in regions where the disease is prevalent. Mosaic is stated to be spreading widely and rapidly in Davao.

In October, 1938, Szinkom oranges at the Lipa Citrus Station were found to be infected by *Phytophthora citrophthora*, not hitherto reported from the Philippines, in combination with *Oospora citri-aurantii* and *Botrytis cinerea*.

Resistance to *Sclerotium* [? *rolfsii*] was shown in a groundnut varietal

trial by the progeny of a cross between the highly resistant Virginia Jumbo and the fairly susceptible Macapno.

A new bean [*Phaseolus vulgaris*] disease caused by a species of *Rhizoctonia*, possibly *R.* [*Corticium*] *microsclerotia* [cf. ibid., xix, p. 3], was responsible for severe damage in Davao in 1938.

Of the selections derived by hybridization from seed potatoes of Michigan origin for cultivation in the Baguio district, where late blight [*Phytophthora infestans*] is very serious, Baguio selection No. 8 has proved to be the most resistant, withstanding infection even under the humid conditions favouring the pathogen; selections Nos. 1–5 are slightly less resistant, but still commercially profitable even during the rainy season, while Nos. 6 and 7 are considerably more susceptible.

GLISTER (G. A.). **A new antibacterial agent produced by a mould.** *Nature, Lond.*, cxlviii, 3755, p. 470, 1941.

A mould, probably a species of *Aspergillus*, has been found to produce a powerful anti-bacterial agent with chemical properties different from those of penicillin [*R.A.M.*, xx, p. 484] and a much wider anti-bacterial range.

RIKER (A. J.), HENRY (B.), & DUGGAR (B. M.). **Growth substance in crown gall as related to time after inoculation, critical temperature, and diffusion.**—*J. agric. Res.*, lxiii, 7, pp. 395–405, 1941.

In a study on the part played by growth substances of the hetero-auxin group in the formation of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xix, pp. 202, 560], no significant differences in auxin content were observed between inoculated and control tomato tissue 1, 4, 8, and 16 days after inoculation, especially when compared on a total nitrogen basis. There was half as much auxin in galls and control stems from decapitated tomatoes as in those from whole plants, although both kinds of plants had galls of a similar size. The auxin content of tomato stems grown at 27° C., when galls develop, did not differ significantly from those grown at 31°, when galls do not develop; nor did the auxin content diffusing from stems bearing galls differ significantly from that from control stems.

Reviewing the evidence regarding the pathogenic action of *Bact. tumefaciens*, the authors show that while the bacteria produce indole-acetic acid or a similar substance in cultures, and proliferation resembling crown gall tissue is induced by the application of extracts of crown gall tissue, or of cultures of the organism, or of beta-indole-acetic acid, this acid or some similar substance elaborated by the bacteria cannot be the factor responsible for the pathogenicity of *Bact. tumefaciens* for the following reasons. (1) Various non-pathogenic bacteria produce beta-indole-acetic acid or closely related substances; (2) a variety of extracts of plants and chemicals are capable of inducing proliferation in plants; (3) the concentrations of the growth-promoting substance in bacterial cultures and plant tissues are very much smaller than those of the chemicals employed for inducing pathological growth; and (4) some plants respond to beta-indole-acetic acid that are not susceptible to crown gall and some are susceptible to the latter that do not respond to the former. The writers conclude that, so far as they

are aware, *Bact. tumefaciens* is pathogenic independently of auxin production.

WILD (A. S.) & TEAKLE (L. J. H.). **Experiments with micro-elements for the growth of crops in Western Australia. II. Experiments on high level sandy and gravelly country in the southern Wheat belt.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xviii, 2, pp. 91–96, 1941.

Experiments carried out at Dumbleyung and Jilakin in Western Australia showed that beneficial results were obtained when copper sulphate was applied at the rate of 10 lb. per acre (in addition to superphosphate) to high-level, sandy and gravelly soils planted to wheat [*R.A.M.*, xx, pp. 352, 595]. In one experiment at Dumbleyung in 1940 the yield of the copper sulphate-treated plot was 8·2 bush. per acre compared with 4·9 bush. for a similarly treated plot but from which the copper sulphate was withheld. Growers experimenting with this type of land should apply a mixture of copper sulphate (about 5 lb. per acre) and superphosphate to strips across the area and compare the growth thereon with that on adjacent strips receiving superphosphate only. Bencubbin wheat grown on copper-deficient soil developed a large proportion of dummy heads, generally pale yellow, while a purplish discoloration of the straw and leaf sheaths was common, and there was a marked tendency towards the formation of secondary green tillers while the main plant was maturing.

TEAKLE (L. J. H.) & BURVILL (G. H.). **Experiments with micro-elements for the growth of crops in Western Australia. IV. Experiments at Muchea and Maida Vale.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xviii, 2, pp. 125–132, 1941.

In fertilizer experiments carried out in the neighbourhood of the Perth metropolitan area, Western Australia, on diatomaceous swamp soil, semi-swamp, and poor sandhill country the value of copper compounds, included in the fertilizers, was proved for a number of crops, including maize, Sudan grass [*Sorghum sudanense*], oats, and Japanese millet [*Echinochloa crus-galli*]. In one test with four fertilizer mixtures, namely, (*a*) 12 cwt. per acre potato manure for potatoes and 3 cwt. for maize, Japanese millet, and Sudan grass, (*b*) the same plus 18 lb. copper sulphate per acre, (*c*) as for (*a*) plus 18 lb. manganese sulphate per acre, and (*d*) as for (*a*) plus 18 lb. copper sulphate, 18 lb. manganese sulphate, and 6 lb. zinc sulphate per acre, potatoes grown without manganese showed a yellowish-green foliage and an unthrifty top growth. Maize grown without copper was only 18 in. tall after about three months, and showed a striped chlorosis, in addition to characteristic leaf-tipping. Some of the leaf tips died before emergence, and remaining trapped in the leaf sheaths, gave the plants a distorted appearance. With copper additions, the plants appeared normal, and were 30 to 40 in. tall. Where copper was not used, internodal stem elongation was restricted, and the leaves trailed on the ground, giving the plants a conifer-like shape. The growth of the maize was slightly improved by manganese alone and in combination with copper. Millet gave a less consistent response to copper. In the absence of this metal, the growth of Sudan grass was poor and tussocky, and leaf tipping

was severe. Only a few plants produced even small heads, and they were only about 1 ft. high. In the presence of copper, the plants grew normally, and headed out at a height of 3 to 5 ft.

In a test on moist land in the Maida Vale district oats grown without copper yielded 2·9 cwt. of straw per acre, as against 5·4 cwt. for plots receiving copper sulphate (20 lb. per acre).

RICEMAN (D. S.) & ANDERSON (A. J.). **Response to zinc on a South Australian soil.**—*J. Aust. Inst. agric. Sci.*, vii, 2, p. 82, 1941.

In an experiment at Robe, South Australia, the yield of Mulga oats growing on loose sand dunes amounted to 10·6 bush. grain and 20·9 cwt. straw per acre when copper sulphate was applied at the rate of 56 lb. per acre, and to 18 bush. grain and only 15·1 cwt. straw when zinc sulphate was also added at the rate of 28 lb. per acre [see preceding abstracts]. Subsequent tests confirmed this result, and excellent crops and pastures were obtained by the addition of zinc to the superphosphate-copper sulphate fertilizer.

LUTHRA (J. C.). **Solar treatment of Wheat loose smut.**—*Indian Fmg*, ii, 8, pp. 416–418, 1 pl., 1941.

Since 1929 the writer has been investigating the possibilities of combating loose smut of wheat (*Ustilago tritici*) in the Punjab by means of solar heat [*R.A.M.*, xiv, p. 23]. In experiments at the Lyallpur Agricultural College and Research Institute, of a number of combinations of several hours 'pre-soaking' in water and varying periods of exposure to the sun, the most effective proved to be four hours of each treatment, which resulted in a perfectly sound crop, with no reduction of germination, whereas the incidence of infection in the untreated samples ranged from 5 to 15 per cent. The best months for the application of the solar treatment are May and June, when the maximum shade temperature reaches 120° F., or before the onset of the rains about mid-July; satisfactory control has been achieved at later dates up to September (temperature 104°), but under the conditions then prevailing success cannot be guaranteed. However, even in the moderately hot climate of Gurdaspur (shade temperature in July 102°), a crop raised from treated seed contained only 0·3 per cent. smutted heads compared with 18 per cent. in a stand grown from an untreated sample.

MIDDLETON (J. T.). **Root rot of Barley caused by Pythium hypogynum n.sp.**—Abs. in *Phytopathology*, xxxi, 9, p. 863, 1941.

Pythium hypogynum n.sp. is described [without a Latin diagnosis] as producing an irregularly septate mycelium, 1·5 to 8·3, average 5·1 μ in diameter; terminal, rarely intercalary, subspherical to spherical, smooth, thin-walled sporangia, 6·5 to 34·6 (average 22·1) μ; terminal, subspherical to spherical oogonia, 10·2 to 35·1 (22·0) μ; a single hypogynous antheridium, delimited within the oogonial stalk at a distance ranging from 5 to 30 μ below the oogonium, the antheridial cell measuring 3 to 11·1 by 2·8 to 8·3 (6·6 by 5·4) μ; and plerotic oospores containing a single reserve globule and a prolate ellipsoidal or flattened refringent body; germination was not observed. The fungus causes a

root rot of barley in poorly drained soils in Missouri, manifested by discoloration and flaccidity of the cortical tissues and stunting and chlorosis of the shoots. Diseased plants rarely stool or produce heads. Isolates of *P. hypogynum* from infected roots were experimentally shown to be pathogenic.

HOYMAN (W. G.). **Concentration and characterization of the emetic principle present in Barley infected with Gibberella saubinetii.**—*Phytopathology*, xxxi, 10, pp. 871–885, 1 diag., 1941.

A detailed, tabulated account is given of the writer's studies at the Iowa State College on the nature of the principle in barley infected by *Gibberella saubinetii* which induces emesis in pigs [*R.A.M.*, xvii, p. 657]. The substance was extracted from infected grain with water over a wide temperature range. It was resistant to drying but was partly inactivated by autoclaving. Methyl alcohol was an efficient solvent of the principle from concentrated aqueous extracts and further purification of the soluble material was obtained by extraction with ether. Analysis indicated the presence of nitrogen but no sulphur or halogens. It is concluded that the substance may be an alkaloid but the evidence is insufficient to warrant that conclusion.

SCHWEIZER (G.). **Über die Kultur von Claviceps purpurea (Tul.) auf kaltsterilisierten Nährböden.** [On the cultivation of *Claviceps purpurea* (Tul.) on cold-sterilized nutrient media.]—*Phytopath. Z.*, xiii, 4, pp. 317–350, 12 figs., 1941.

A comprehensive account is given of the writer's method of obtaining sclerotia of *Claviceps purpurea* in pure culture [*R.A.M.*, xix, p. 273; xx, p. 76] at the Institute of Agriculture and Plant Breeding, Giessen, Germany. The rye seeds (the use of barley or wheat for the purpose entails the incorporation of special adjuncts with the medium and is not further considered here), after thorough washing in cold, running water and stirring to remove particles of dirt and dust, are packed in a thick layer in a covered vessel at 20° C. to germinate, the process being interrupted as soon as a grain's length is attained, when the embryos and radicles, with the addition of a few drops of carbon disulphide, are passed several times through a mincing-machine to produce a thin broth. This in turn is pressed with a wooden pestle through a fine sieve until the correct consistency for easy spreading is reached. The resultant emulsion is then thoroughly mixed with an antiseptic, e.g., carbon disulphide plus ethyl chloride, methyl chloride plus ethyl chloride, or petrol ether plus ethyl chloride at the rate of 1 c.c. per 150 gm., the antiseptics being blended in such a way as to give a boiling point of 27°. The sterilized emulsion is poured into glass dishes which are left covered for an hour, whereupon the antiseptic is removed by means of the vacuum engendered by the cold sterilization apparatus (described in the author's 'Einführung in die Kaltsterilisationsmethode', G. Fischer, Jena, 1937), and ascospores immediately transferred to the medium. These organs are best obtained from three months- to one-year-old sclerotia, sterilized by a dip in a 1 in 5,000 solution of iodine, 3 per cent. hydrogen peroxide, or 0·1 to 0·3 per cent. quinosol, placed after washing in sterile distilled water on damp sand in glass containers

in a refrigerator for 20 to 25 days (or exposed to frost in winter), returned to a temperature of 15° to 20°, and inoculated with pollen from flowering rye or preferably with an ethereal or aqueous solution of the same. The pollen carries a 'contagium' which stimulates the germination of the sclerotia. This 'contagium' comprises one or more specific substances, which are water-soluble and thermostable. Under these conditions fruiting begins after three to five days, and in order to obtain a plentiful supply of ascospores the brick- to dark-red heads of the perithecia are transferred to slides smeared with saccharose or dextrose agar in a moist chamber exposed to the light, where forcible expulsion commences within an hour. The ascospores may then be removed with a layer of agar to the above-mentioned rye emulsion.

Germination takes place rapidly, the conidial (*Sphacelia*) stage requiring an acid reaction for its development and the sclerotia an alkaline one, the latter being recognizable by the odour of trimethylamine coinciding with the inception of honey dew production at the close of the conidial phase. The close mutual relationships subsisting between the metabolism of the fungus and the enzymatic reactive activity of the medium are to some extent comparable with the relation of the parasite to its host in nature, and the associated automatic development of alkalinity in the cold-sterilized cultures is a prerequisite condition for sclerotial production.

The sclerotia obtained by this method are anatomically similar to those developing under natural conditions, while their alkaloid content (average of 0·279 per cent.) approximates to that of the best commercial brands of the drug.

Morwood (R. B.). **Seed treatment of Sorghums.**—*Qd agric. J.*, lvi, 3, p. 232, 1941.

Wheatland milo sorghum seed-grain artificially inoculated with *Sphacelotheca sorghi* [*R.A.M.*, xxi, p. 10] and treated with copper carbonate, mercurial dust A, mercurial dust B, cuprous oxide, and mercurial dust C, each applied at the rate of 2 oz. per bush., gave, respectively, 0·4, 0·4, 0·8, 2·8, and 9·0 per cent. infected heads, as against 10·8 per cent. for the untreated control seed.

Ullstrup (A. J.). **Inheritance of susceptibility to infection by Helminthosporium maydis race 1 in Maize.**—*J. agric. Res.*, lxiii, 6, pp. 331–334, 1 fig., 1941.

In further studies [*R.A.M.*, xx, p. 526] of *Helminthosporium maydis* [considered to be the conidial stage of *Ophiobolus heterostrophus*: ibid., v, p. 293], crosses between the inbred line *Pr* and *Hy*, 38–11, and *Tr*, respectively, were studied during 1939 for inheritance of resistance to race 1 of the fungus. The results indicate that resistance and susceptibility to this race are conditioned by a single pair of genes, which are designated as Hm and hm. In heterozygous individuals resistance is completely dominant. The line *Pr* is stated to be the only known source of the recessive allelomorph for susceptibility, all crosses studied showing no other than typical monogenic inheritance.

Ho (W. C.). **Soil-inhabiting fungi attacking the roots of Maize.**—*Iowa St. Coll. J. Sci.*, xvi, 1, pp. 72–74, 1941.

In greenhouse and field inoculations at the Iowa State College with various fungi isolated from maize roots, the pathogenicity of *Pythium de Baryanum* and *Helminthosporium sativum* to that host [*R.A.M.*, xx, p. 357] was established for the first time. The former developed early in the growing season and caused necrosis of the fine rootlet tips, while the latter appeared on the diseased roots and mesocotyls midway through the vegetative period. *P. de Baryanum* became less destructive as the soil temperature rose, whereas warmer conditions favoured *P. graminicola* and enabled it to cause rapid necrosis and a brown, water-soaked appearance of the root tips. At the same time, *Gibberella saubinetii* and *Rhizoctonia* [*Corticium*] *solani* were frequently observed on the lower part of the mesocotyl, subsequently inducing discoloration and cortical necrosis of the roots. Later *Penicillium oxalicum* and other organisms besides *H. sativum* produced further necrosis of the mesocotyl and basal part of the roots. Still later, *Fusarium moniliforme* [*G. fujikuroi*], *Aspergillus niger*, *Trichoderma lignorum* [*T. viride*], which tended to suppress its competitors [ibid., xix, p. 589 *et passim*], and *F.* spp. developed in the root lesions, while *Diplodia zeae*, *P. oxalicum*, *A. niger*, and *F.* spp. were present in abundance on the crowns of ripe plants, to the exclusion of the organisms encountered in the early stages of growth.

Of the 14 open-pollinated varieties studied for their reactions to *Pythium de Baryanum* and *P. graminicola*, Kossuth County Reliance and Stem Yellow Dent were susceptible and Black Yellow Dent and Krug more resistant. Among 15 inbreds, only Ldg (k), Black 349, Lancaster 289, Osterland 426, and Hy showed some degree of resistance. Single crosses representing combinations of less susceptible inbreds proved resistant to both species of *Pythium*, the same being true of the Iowa hybrids. In general, infection became more severe in plants held for ten days at 8° prior to transference to a temperature of 22° to 27° than in those kept continuously under the latter conditions, exceptions to this rule being Triple Dent, Silver Dent, Silver King, and Gold Mine, which suffered more severely at uninterrupted higher temperatures.

Seed treatment, which was particularly effective at low temperatures, reduced the disease ratings of susceptible varieties, inbreds, and double crosses by from 22 to 69, 34 to 83, and 26 to 60 per cent., respectively.

Edwards (E. T.). **Internal grain infection in Maize due to Gibberella fujikuroi and Gibberella fujikuroi var. subglutinans.**—*J. Aust. Inst. agric. Sci.*, vii, 2, pp. 74–82, 2 figs., 1 graph, 1941.

Laboratory experiments carried out at Madison, Wisconsin, demonstrated that little if any internal grain infection by *Gibberella fujikuroi* [see preceding abstract] or *G. fujikuroi* var. *subglutinans* could be established in mature ears of maize maintained in a warm, moist atmosphere for three days before, and four after, inoculation, though there was a slight increase in the incidence of naturally occurring internal grain infection.

In field tests, a high incidence of internal grain infection by both fungi resulted when the ears were inoculated (1) just after pollination, (2) five or six days after pollination, (3) 12 to 15 days after, (4) at the dent stage, and (5) when the grain was almost mature. The highest incidence of infection occurred when the ears were inoculated between pollination and the dent stage. Injury to the husk and the maintenance of the ear in moist atmosphere afterwards were important factors conducing to the establishment of infection. Ears so treated between pollination and the dent stage showed much kernel rot, though such rot seldom developed unless the grain had been injured.

CUMMINS (G. B.). **Identity and distribution of three rusts of Corn.**—*Phytopathology*, xxxi, 9, pp. 856–857, 1 fig., 1941.

A specimen of leaf rust of maize collected by E. C. Stakman in Peru and labelled *Puccinia sorghi* was found on examination to be quite a distinct species, characterized by irregular, usually angular, chestnut-brown teleutospores, 29 to 41 by 19 to 27 μ, with an only slightly thickened apical wall, in contrast to the much thickened apex of *P. sorghi* [*P. maydis*], and yellowish or golden uredospores, 29 to 36 by 21 to 29 μ, furnished with four or five poorly defined equatorial pores; mesospores were present in abundance. The species was identified as *P. polysora*, previously reported on maize from the United States, the earliest record (1879) being from Massachusetts, British Honduras, Costa Rica, Cuba, Guatemala (also on *Euchlaena mexicana*), Mexico, Panama, Puerto Rico.

Angiopsora zeae [*R.A.M.*, xvii, p. 452] is somewhat similar to *P. polysora* in the uredo stage, but the sori of the former tend to occur in small groups while its uredospores are not only smaller (22 to 30 by 16 to 20 μ), but more finely echinulate and subhyaline. The teleuto stage is readily distinguishable by the catenulate, unicellular spores, usually two to each sessile chain. *A. zeae* has been recorded on maize from the United States, Guatemala, Puerto Rico, Santo Domingo, and Trinidad.

WOGLUM (R. S.) & LEWIS (H. C.). **Grapefruit damage from Septoria.**—*Calif. Citrogr.*, xxvi, 12, pp. 367, 394, 1 fig., 1941.

During the past season, severe spotting was caused to grapefruit in California by *Septoria* [? *citri*]. The disease has been present locally for many years, but has recently become of increasing importance, probably owing to a succession of wet, warm winters, followed by humid weather in spring. Severe damage has been caused in most parts of central and southern California, and Valencia oranges have also been affected, mostly in the central districts. Spotting often takes the form of tear stains or streaks, the spots being dark brown or black, depressed, with a narrow, greenish margin, and ranging in size from scattered stippling to almost continuous large, deep pits.

Spraying should be carried out in late November or December, using a mixture composed of 1 lb. copper sulphate, 5 lb. zinc sulphate, and 4 lb. hydrated lime per 100 gals. water. The cost should not exceed 10 to 15 cents per tree. Treatment in February or March, after the disease has already appeared, has arrested any further development.

In central California, where zinc-lime whitewash is used against insect infestation, 1 lb. copper sulphate per 100 gals. water should be added if protection against *Septoria* infection is desired.

Fawcett (H. S.) & Cochran (L. C.). **Resistance of Citrus tissue and psorosis virus A to heat.**—Abs. in *Phytopathology*, xxxi, 9, p. 861, 1941.

The results of five separate trials between 1936 and 1940, in which bud wood of Valencia orange from trees affected by psorosis A (*Citrivir psorosis* var. *vulgare*) [*R.A.M.*, xx, p. 360] were immersed in water heated to different constant temperatures prior to the insertion of their buds into virus-free nursery trees, indicated that this method is unlikely to be of practical value in the control of the disease. Only in three trees out of the 130 in which the buds remained alive in the 1940 test, for instance, did foliar symptoms fail to develop.

Caldwell (N. E. H.) & Blackford (F. W.). **Control schedules for Citrus pests and diseases in south-eastern Queensland.**—*Qd agric. J.*, lvi, 2, pp. 117–120, 1941.

A spray programme in tabulated form is presented for the control of various citrus pests and diseases in south-eastern Queensland, giving the different combinations of diseases controlled by the same treatment, time of application, dosage, and the varieties affected.

Franco do Amaral (S.). **A poda da Laranjeira no tratamento da leprose.** [Pruning of the Orange in the treatment of leprosis.]—*Biologico*, vii, 7, pp. 183–186, 4 figs., 1941.

Full directions are given for the drastic pruning of orange trees suffering from leprosis in Brazil [*R.A.M.*, xx, p. 530]. The method involves the removal by sawing, preferably from the end of May to mid-June, of all the main branches, leaving only those with a diameter of 2 to 3 in., from which all the buds are stripped with the exception of two or three per branch. It is advisable to apply to the bark thus exposed a coating of lime or Bordeaux mixture, the latter acting not only as a protectant against sun scorch but also as a disinfectant. A more conservative method of pruning, in which only the green branches are excised, is less suitable for large-scale use, but may be practised in small plantations where the loss of one or more harvests, incidental to the drastic treatment, would entail undue hardship.

Young (V. H.) & Tharp (W. H.). **Relation of fertilizer balance to potash hunger and the Fusarium wilt of Cotton.**—*Bull. Ark. agric. Exp. Sta.* 410, 24 pp., 3 graphs, 1941.

In investigations conducted in Arkansas from 1937 to 1939, the cotton varieties Cook, Rowden 2088, and Half & Half were planted on fine alluvial soil in which cotton in earlier years had been seriously infected with *Fusarium* wilt [*F. vasinfectum*: *R.A.M.*, xviii, p. 452] and had shown marked symptoms of potash deficiency (rust) [ibid., xix, p. 403; xx, p. 300]. Nine different fertilizer treatments, based on 600 lb. of 6–8–6 (nitrogen, phosphorus, potassium) fertilizer per acre were tested, the proportions of the elements being varied to provide a series of complete and incomplete fertilizer combinations.

The mean wilt intensities for the three varieties during the whole period were 2·74, 6·03, and 55·66 per cent., respectively. The effect of any treatment on any one variety was, however, similar to that on the other two.

Thus, combinations with the least amount of potash (6–12–4) gave effective control of 'rust' and conspicuously reduced wilt. The heaviest amounts of potash (6–12–12 and 0–4–12) gave the best control of wilt. Unbalanced applications (unfertilized controls, 6–8–0, and 0–8–0) increased wilt and induced pronounced 'rust'. Phosphate used alone caused increased wilt, as compared with the non-fertilized controls. All the fertilizers except phosphate alone (0–8–0) gave highly significant yield increases on Half & Half. The highest potash application (6–12–12) gave better results than one in which the amount of potash was reduced to one-third of this amount.

Under the conditions of the experiment, potash applications gave definite control of 'rust' (potash hunger) and very marked control of wilt, whereas high applications of nitrogen and phosphate, and of phosphate without potash were either ineffective or detrimental.

Increased susceptibility to attacks of *F. vasinfectum* was associated with increased severity of potash-deficiency symptoms.

Greathouse (G. A.) & Rigler (N. E.). **Alkaloids from Zephyranthes texana, Cooperia pedunculata and other Amaryllidaceae and their toxicity to Phymatotrichum omnivorum.**—*Amer. J. Bot.*, xxviii, 8, pp. 702–704, 1941.

The alkaloid lycorine, present in the bulb and root tissues of *Zephyranthes texana* and *Cooperia pedunculata* in concentrations of 0·02 and 0·04 to 0·05 per cent., respectively, of the fresh weight, was shown in tests at the Texas Agricultural Experiment Station to prevent the growth of *Phymatotrichum omnivorum*, the agent of root rot [of cotton and other crops: *R.A.M.*, xviii, p. 24], at a strength of 0·003 per cent., while a second alkaloid, presumed to be ψ-lycorine, isolated from the mother liquors of *C. pedunculata* at a concentration of approximately 0·002 per cent., acted similarly on the fungus at a strength of 0·0045 per cent. The total quantities of lycorine and ψ-lycorine present in *Z. texana* and *C. pedunculata*, respectively, were about 7 and 15 times as much, respectively, as was necessary to inhibit the development of *P. omnivorum*. Various organs, notably the peripheral bulb scales, the shortened stem, and the roots, of 11 other species of Amaryllidaceae were also found to contain alkaloids which are thought likely to contribute to the established immunity from root rot of members of this family.

Blank (L. M.) & Talley (P. J.). **Are ammonium salts toxic to the Cotton root rot fungus?**—*Phytopathology*, xxxi, 10, pp. 926–935, 1 graph, 1941.

No evidence was obtained in the writers' further studies at the Texas Agricultural Experiment Station on the action of several concentrations ranging from 0·0063 to 0·075M of ammonium sulphate and ammonium phosphate on cultures of the cotton root rot fungus, *Phymatotrichum omnivorum*, in a synthetic nutrient solution [*R.A.M.*,

xx, p. 256], that the toxicity of these compounds to the pathogen is a property of the ammonium ion. An acid condition, inhibiting further growth, rapidly develops in improperly constituted nutrient solutions with ammonium salts as the nitrogen source: this may be prevented by the addition of calcium carbonate in the proper amount to result in a 0·0125M concentration in the final volume. Ammonium nitrogen was found to provide a good source of nitrogen for *P. omnivorum* in soil cultures, no evidence of toxicity being observed with concentrations up to 0·075M. These data suggest that the beneficial effects of the treatment of diseased plants with ammonium compounds represent a response to the reception of additional supplies of available nitrogen rather than a reduction in the virulence of the pathogen, and it is doubtful, therefore, whether permanent eradication and control can be achieved by the use of ammonium salts.

Studies on the root-rot disease of Cotton in the Punjab.

Luthra (J. C.), Vasudeva (R. S.), & Ashraf (M.). **VIII. Further studies on the physiology of the causal fungi.**—*Indian J. agric. Sci.*, x, 4, pp. 653–662, 1940.

Luthra (J. C.) & Vasudeva (R. S.). **IX. Varietal susceptibility to the disease.**—loc. cit., xi, 3, pp. 410–421, 1941.

Vasudeva (R. S.) & Sikka (M. R.). **X. Effect of certain fungi on the growth of root-rot fungi.**—loc. cit., xi, 3, pp. 422–431, 2 pl., 1 diag., 1 graph, 1941.

In further studies at the Lyallpur (Punjab) Agricultural Research Institute on the root rot of cotton caused by *Macrophomina phaseoli* and *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xix, p. 90], all the carbohydrates tested, viz., maltose, glucose, sucrose, lactose, galactose, dextrin, and soluble starch, supported fairly abundant growth of both fungi, agar media being more favourable than liquid substrata both for growth and for rapid acidification, which does not occur, however, in the case of *M. phaseoli*, when lactose or galactose provide the source of carbon. Floating cultures on a liquid synthetic medium grew almost as quickly as those on agar, whereas in submerged cultures development was slow and acidification retarded. A depressing effect on growth and delay in acidification was further exerted on both fungi by carbon dioxide at concentrations of 20 per cent. and upwards, *C. solani* being the more sensitive of the two in this respect, while *M. phaseoli* reacted similarly to an atmosphere of pure oxygen; on the other hand, pure nitrogen and a 50 : 50 mixture of nitrogen and oxygen did not appreciably inhibit growth or retard acidification.

None of the large number of native and foreign varieties and strains of cotton tested from 1937 to 1939 for their reaction to the root-rotting pathogens gave evidence of any significant degree of resistance, while selfed seeds of apparently healthy individuals in infected plots did not give rise to resistant plants.

The presence of *Trichoderma lignorum* [*T. viride*] and *Aspergillus niger* in cultures of *M. phaseoli* and *C. solani* on various synthetic and natural media greatly restricted the growth of the cotton root rot fungi [ibid., xii, p. 192; xix, p. 259, *et passim*], the hyphae of which undergo

lysis on coming into contact with those of the inhibitors. The activity of filtrates of *M. phaseoli* and *C. solani* was likewise reduced by the admixture of *T. viride* and *A. niger* with the cultures, the times required for the wilting of plants by filtrates of *T. viride—M. phaseoli*, *T. viride+C. solani*, *A. niger+M. phaseoli*, and *A. niger+C. solani* being 270, 270, 300, and 300 minutes, respectively, compared with 180 and 60, respectively, for *M. phaseoli* and *C. solani* alone.

Drechsler (C.). **Predaceous fungi.**—*Biol. Rev.*, xvi, 4, pp. 265–290, 1941.

The author summarizes his own work to date on predaceous fungi at the United States Horticultural Station, Beltsville, Maryland [*R.A.M.*, xxi, p. 15], and critically discusses that of other workers in the same field.

Marchionatto (J. B.). **'Acrostalagmus aphidum' hongo parásito de los Pulgones.** [*Acrostalagmus aphidum*, a fungus parasitic on Aphids.]—*Physis, B. Aires*, xix, pp. 51–54, 2 figs., 1941.

Acrostalagmus aphidum [*R.A.M.*, viii, p. 641], collected from aphids on carnations at an Argentinian plant quarantine station, is stated to be readily cultivable on standard media. On potato agar with 1 per cent. glucose the white, later cream-coloured, cottony mycelium, 2·5 μ in diameter, branches dichotomously, the erect, septate fertile hyphae, generally trifurcate at the apex, giving rise to gregarious or solitary, acicular, continuous, hyaline conidiophores, 14 to 18 μ in length, from the apices of which are abstricted 8 to 11 straight, cylindrical, ovoid, or cylindrical to oval conidia, 5 to 12 by 2 to 2·5 μ. Germination takes place with the greatest rapidity in a 2 per cent. glucose solution. Reference is briefly made to Petch's observations on the taxonomic relationships between *Cephalosporium* and *Acrostalagmus* [ibid., v, p. 97].

Smith (F. G. W.). **Sponge disease in British Honduras, and its transmission by water currents.**—*Ecology*, xxii, 4, pp. 415–421, 1 fig., 2 maps, 1941.

Commercial sponges, mostly of the species *Hippiospongia lachne* and *H. gossypina*, in the Turneffe lagoon, British Honduras, sustained extensive damage during the summer of 1939 from the attacks of an unidentified fungus corresponding in all respects to the agent of a similar epidemic in the Bahama Islands in the previous winter. The hyaline, amorphous filaments of the organism measure 1 to 2 μ in diameter, and usually occur in groups, one end being attached to the dead sponge fibre and the other free. Out of 45 sponges examined from widely separated areas of the lagoon, 42 revealed the presence of the fungus, which is believed to have been carried from the Bahamas to Turneffe by means of water currents.

Sokoloff (V. P.) & Klotz (L. J.). **Mortality of the red scale on Lemons through infection with a spore-forming bacterium.** -Abs. in *Phytopathology*, xxxi, 9, p. 864, 1941.

Adult females of *Aonodiella aurantii* on lemons were destroyed to

the extent of 100 per cent. under controlled laboratory conditions by contact with a denitrifying bacterium isolated from the soil and provisionally designated *Bacillus* 'C', mass infection of the 7,000 insects used in the tests being secured by immersion, spraying, or dusting with the spores of the organism. Symptoms of the bacterial disease included gas production, distortion of the pygidia, and a characteristic brown discoloration of the insects, followed by disintegration and drying. The *Bacillus* was detected in smear preparations from diseased and dead scales, extracts from which contained little or no nitrate in contrast to the measurable amounts present in healthy insects. It is a large, motile, Gram-positive rod, forming spores in the equatorial position. Though normally aerobic, it is capable of anaerobic growth in the presence of nitrate or nitrite on various organic substances, including chitin.

White (R. T.). **Development of milky disease on Japanese Beetle larvae under field conditions.**—*J. econ. Ent.*, xxxiv, 2, pp. 213–215, 1941.

Data are presented indicating the importance of milky disease (*Bacillus popilliae* and *B. lentimorbus* Dutky) as a natural control agency in areas supporting heavy populations of Japanese beetle (*Popillia japonica* Newm.) larvae [*R.A.M.*, xx, p. 114 and next abstract]. Observations in selected areas in New Jersey, Maryland, and Washington, D.C., in 1939–40 showed a rapid build-up of disease, followed by a corresponding decrease in the insect population. Thus, in one such inspection the population of beetles per sq. ft. on 24th August, 1939, was 37, and of 366 larvae 4 per cent. were diseased, while by 17th June, 1940, the population had sunk to 6·3 per sq. ft., and of 382 larvae 67 per cent. were infected.

Dutky (S. R.). **Susceptibility of certain Scarabaeid larvae to infection by type A milky disease.**—*J. econ. Ent.*, xxxiv, 4, pp. 215–216, 1941.

In addition to *Popillia japonica*, the following Scarabaeid larvae were shown by inoculation tests to be susceptible to infection by type A milky disease (*Bacillus popilliae*) [see preceding abstract]: *Anomala orientalis* Waterhouse, *Autoserica castanea* Arr., *Cyclocephada borealis* Arr., *Phyllophaga auxia* Le C., *P. bipartita* Horn, *P. ephilida* (Say), *P. fusca* Frohl., *P. rugosa* Melsh., *Strigoderma arboricola* (F.), and *Strigodermella pygmaea* (F.).

[A further paper by the same writer on pp. 217–218 gives full directions for laboratory and field tests of the potential value of *B. popilliae* and *B. lentimorbus* in the control of soil-inhabiting larvae.]

Serrano (M.). **Über die Systematik von 18 aus verschiedenen Krankheitsprozessen der menschlichen Haut gewonnenen Sprosspilzen.** [On the taxonomy of 18 yeasts isolated from various pathological conditions of the human skin.]—*Z. Parasitenk.*, xii, 1, pp. 1–35, 46 figs., 1941.

Of the 18 yeast-like fungi isolated over a four-year period from various human disorders, mostly of the skin, at the Dermatological Clinic of Bonn University and cultured on a number of standard media, three are referred to *Candida triadis* [*C. albicans*: *R.A.M.*, xix, p. 535]

and one to each of the following: *C. tropicalis*; a variety of the same species differing from the type in its inability to ferment maltose and saccharose; *C. flareri* [loc. cit.]; *C. albicans*; *Mycotorula unguis* (Weil & Gaudin 1919); *Kloeckeraspora apiculata*; a new race *Zygopichia peptoni* of *Z. alcoholophila*; a new [unnamed] species of *Saccharomyces*; *Rhodotorula mucilaginosa* var. *pararosea*; *M. azymatica* n.sp., characterized by its inability to ferment any of the six sugars tested; *Torulaspora alkoholi* n.sp., which produced substantial amounts of alcohol in grape must (6·04 vol. per cent.) and fermented only glucose; a variety (*azymatica*) of the foregoing, utilizing none of the sugars; one to *Torulopsis glycosi* n.sp., assimilating glucose only; and a new [unnamed] variety of *R. rosae*. Each fungus is described from the cultural, morphological, physiological, diagnostic, and taxonomic standpoints. [No Latin diagnoses are given.]

Gill (W. D.). **Mycotic infections of the respiratory tract.**—*Trans. Amer. Acad. Ophthal. Oto-laryng., 1941*, 2, pp. 108–116, 1941.

This is a review, followed by a bibliography of 67 titles and a discussion (pp. 116–119), of the available information concerning the relation of various groups of fungi to diseases of the respiratory tract.

Moore (M.). **Histoplasma capsulatum : its cultivation on the chorio-allantoic membrane of the developing Chick and resultant lesions.** —*Amer. J. trop. Med.*, xxi, 5, pp. 627–642, 3 pl., 1941.

At the Barnard Free Skin and Cancer Hospital, St. Louis, Missouri, the author successfully inoculated the chorio-allantoic membrane of developing chicks [*R.A.M.*, xx, p. 258] with a seven-year-old culture of *Histoplasma capsulatum*. On this substratum the fungus undergoes a gradual conversion from the saprophytic stage characteristic of its development in pure culture to the parasitic phase, represented by yeast-like cells [ibid., xx, p. 578], indicating that the stalagmospores, aleuriospores, or ascus-like cells formed on an artificial medium are probably asci of a degenerate type.

Sproule (W. H.). **The yeast and mold service in relation to quality improvement.**—*Canad. Dairy Ice Cr. J.*, xx, 1, p. 50, 1941. [Abs. in *J. Dairy Sci.*, xxiv, 10, p. A 273, 1941.]

The larger Canadian creameries have recognized for a considerable period that butter with a low yeast and mould content is likely to keep better in storage than samples prepared with less stringent sanitary precautions. In a review of eight years progress, D. B. Shutt states that in 1928, 34·8 per cent. of the samples submitted for inspection showed counts of ten yeasts or under per c.c., as compared with only 1·2 per cent. in 1921, the corresponding figures for moulds [*R.A.M.*, xxi, p. 17] being 89·9 and 61·8 per cent., respectively.

Sutton (W. S.). **Irradiation of cheese moulds and bacteriophage by ultra violet light.**—*J. Aust. Inst. agric. Sci.*, vii, 2, pp. 67–73, 1 fig., 1941.

Experiments made to determine the effect of ultra-violet light on moulds developing on cheese rind in the curing process showed that

plates of wort agar exposed to air-borne contamination and then submitted to the light of gas-filled lamps containing mercury vapour for 4 to 16 minutes at a distance of 3 in. gave considerably fewer mould colonies than unexposed plates. The humidity of the surface and preliminary incubation did not affect the results. After incubation for 18 hours and subsequent irradiation, no germination of spores of *Penicillium* sp. and *Cladosporium* sp. occurred, but after 21 and 24 hours' incubation, respectively, germ-tubes were present, and in this stage ten minutes' irradiation caused death. In the pre-germination stage, some spores of both fungi survived ten minutes' irradiation.

When spore suspensions of *Oidium*, *Penicillium* (from cheese rind), *Hormodendron*, *Macrosporium*, *Cladosporium*, and *Aspergillus* were irradiated for periods ranging from five minutes to two hours, susceptibility to destruction was 'in the order named'. The *Aspergillus*, which belonged to the *niger* group, showed development in seven droplets after one hour's irradiation, and only in one droplet after two hours'.

When a newly prepared sugar suspension of *Penicillium* spores from cheese streaked on plates of potato dextrose agar was irradiated for 17 hours at distances of 3, 12, and 72 in. from the light, no growth occurred at 3 or 12, and only very scanty growth at 72 in.; all the controls grew perfectly.

Willingham (J. J.). **Action of mold inhibitors on dairy products.**—*Iowa St. Coll. J. Sci.*, xvi, 1, pp. 152–154, 1941.

Propionic acid was the most effective of the various compounds tested at the Iowa State College for the control of moulds (*Penicillium roqueforti*, *P. camemberti*, and *Oospora lactis*) in dairy products [*R.A.M.*, xx, p. 173], exerting an inhibitory action on the growth of the organisms at 0·5 to 1 per cent. both in raw milk or cream and in pure cultures in Czapek's medium. Other compounds giving moderately satisfactory results were calcium and sodium propionates and sodium benzoate.

Flor (H. H.). **Inheritance of rust reaction in a cross between the Flax varieties Buda and J. W. S.**—*J. agric. Res.*, lxiii, 7, pp. 369–388, 3 figs., 1941.

In greenhouse tests conducted from 1934 to 1939 at the North Dakota Agricultural Experiment Station on the inheritance of factors determining the reaction of flax varieties to rust (*Melampsora lini*) [*R.A.M.*, xix, p. 655], Buda (immune from races 7 and 20 of the rust identified from North and South American collections; resistant to races 1, 5, 6, 10, and 11; semi-resistant to races 3, 14, 15, 17, 18, and 23; moderately susceptible to races 2, 9, 12, 13, and 24; and susceptible to races 4, 8, 16, 19, 21, and 22) was crossed with J.W.S. (immune from 18 out of the 24 races and susceptible to the remaining races 7, 9, 13, 15, 16, and 21). The F_1 generation was immune from all races from which either parent was immune, indicating that immunity was dominant. In the F_2, susceptible genotypes were identified. In the F_3, lines attacked by race 7 were homozygous for immunity from races 3 and 4 and, conversely, those attacked by race 3 or 4 were homozygous for immunity from race 7; lines homozygous for susceptibility to race 4

approximated a ratio of 1 semi-resistant to 2 heterozygous to 1 susceptible to race 3, and lines immune from race 4 a ratio of 1 resistant to 2 heterozygous to 1 susceptible to race 7; lines having all plants either immune from, or semi-resistant to, race 3 had all plants either immune from, or resistant to, race 7; lines segregating for immunity, semi-resistance, and susceptibility to race 3 segregated for immunity, resistance, and susceptibility to race 7; lines having all plants either immune from, or susceptible to, race 3 had all plants either immune from, or susceptible to, race 7.

These results are explained on the assumption that immunity from races 7 and 20 in Buda is conditioned by a pair of dominant factors allelic to the pair of dominant factors conditioning immunity from 18 races in J. W. S., Buda carrying in addition factors responsible for semi-resistance to race 3 and resistance to race 7, which are independent of, and hypostatic to, the immune factors. On this basis the genotype of Buda is expressed as L^1L^1RR and that of J. W. S. L^2L^2rr. Both the L^1 and the R factors appeared to be operative in conditioning resistance to races to which Buda was resistant. The factors L^1L^1 had little effect in races to which Buda was semi-resistant, moderately susceptible, or susceptible, and reductions in the degree of susceptibility appeared to be largely due to the R factor. Neither the L^1L^1 nor the RR factors had any appreciable effect on the seedling reaction to races 4, 8, 19, and 22, to which Buda is susceptible. J. W. S. L^2L^2rr, was susceptible to races 7 and 9, but F_3 plants of genotype L^2L^2RR were resistant to race 7, and their reaction to race 9 varied from moderately susceptible to susceptible. All plants tested were susceptible to races 16 and 21, to which both parents are susceptible. The R factor was incompletely dominant and, under favourable growing conditions, heterozygous L^1L^1Rr or L^2L^2Rr plants were distinctly less resistant to races producing intermediate infection types, e.g., races 3 and 7, than homozygous plants L^1L^1RR or L^2L^2RR. It is suggested that the use of a line having the genotype L^1L^1rr, previously unknown, will be helpful in the identification of physiologic races of the flax rust differentiated by the semi-resistant reaction of Buda.

Green (D. E.). **Diseases of bearded Irises.**—*Iris Yearb., 1941*, pp. 73–76, 1941.

Brief, popular notes are given on the causes, symptoms, and control of the principal diseases of bearded iris in Britain, viz., rhizome or soft rot [*Erwinia carotovora*: *R.A.M.*, xix, p. 119], leaf spot, caused by '*Didymellina* (*Heterosporium*) *gracile*' [*D.* (?) *macrospora*: ibid., xviii, pp. 31, 599], grey mould basal rot, due to *Botrytis cinerea* or a fungus closely related to it, rust (*Puccinia iridis*), and scorch, the cause of which has not yet been ascertained.

Langdon (R. F.). **Occurrence of ergot in Queensland, with special reference to Claviceps pusilla Cesati.**—*J. Aust. Inst. agric. Sci.*, vii, 2, pp. 85–87, 1941.

So far, 13 species of native grasses in south-eastern Queensland have been observed to be affected by ergot in the field, and two others have been found susceptible by artificial inoculation. The species

concerned are *Dichanthium sericeum*, *Bothriochloa decipiens*, *B. intermedia*, *B.* sp., *Cymbopogon refractus*, *Heteropogon contortus*, *Themeda australis*, *Sorghum leicladum*, *Ischaemum australe*, *Eriochloa pseudocrotricha*, *E. procera*, *E.* sp. *Digitaria longiflora*, *Brachiaria whiteana*, and *Capillipedium spicigerum*.

Sclerotia from *Dichanthium sericeum* collected in May, 1940, germinated in October of that year, the species being determined as *Claviceps pusilla* Cesati, described in 1861 from material collected in northern Italy on *Bothriochloa ischaemum*. This appears to be the first time that germination of the sclerotia has been observed in 80 years. It is proposed that the fungus should be known as the 'blue grass ergot'.

The conidia of *C. pusilla* from *D. sericeum* are hyaline, elliptical, or curved, and measure 10 to 15·5 by 5 to 7·5 μ. Some of the curved ones are straight on one side and sharply curved on the other, with the result that they appear to be three-sided. Examination of the conidia from other affected species showed that they were all similar in size and shape to those from *D. sericeum*.

Powell (D.), Anderson (H. W.), & Kohn (R.). **The use of eradicant sprays for controlling Apple scab in Illinois, 1940 results.**—*Trans. Ill. hort. Soc.*, lxxiv, pp. 213–234, 5 figs., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxv, 5, p. 635, 1941.]

In the writers' tests in Illinois in 1940 the initial apple scab [*Venturia inaequalis*] inoculum was reduced by 86 to 90 per cent. by the use of elgetol [*R.A.M.*, xx, p. 370], the most satisfactory ground coverage being secured with the 600 gals. per acre rate of spray at a dilution of 0·5 per cent. The treatment of dead foliage is regarded as a supplementary measure rather than as a substitute for ground spraying, and a reduction in the number of foliar applications where the latter method is practised is not recommended. The chief merit of elgetol lies in the assurance of superior scab control and the improbability of difficulties when seasonal conditions favour the disease or foliar sprays cannot be applied according to schedule.

Smock (R. M.) & Van Doren (A.). **Controlled-atmosphere storage of Apples.**—*Bull. Cornell agric. Exp. Sta.* 762, 45 pp., 16 figs., 4 diags., 1 graph, 1941.

Control of scald [*R.A.M.*, xx, pp. 68, 476] in stored McIntosh apples was obtained in an atmosphere of 5 per cent. carbon dioxide and 2 per cent. oxygen with 1/4 to 1/3 lb. of shredded oiled paper well mixed with each bushel of fruit. When higher concentrations of carbon dioxide are used and consequently the susceptibility to scald is increased, more paper is likely to be needed. The use of a washer in maintaining the atmosphere seemed to reduce scald somewhat, since the alkali dissolves some of the volatiles which cause the disorder. Excellent control of scald on the less susceptible varieties was also obtained with oiled-paper wraps. Although oiled wraps and oiled shredded paper increase the cost of packing considerably, have a drying effect on the atmosphere, and tend to absorb and retain odours from containers, their use is recommended as being still the only satisfactory means of controlling the disorder on

the less susceptible apple varieties. Oiled paper does not control scald on the highly susceptible varieties in controlled-atmosphere (= gas) storage.

Smith (R. E.). **Transmission of diamond canker of the French Prune.**—*Phytopathology*, xxxi, 10, pp. 886–895, 3 figs., 1941.

A detailed account is given of a series of experiments carried out at the University of California, Berkeley, to determine the mode of transmission of diamond canker of Agen French prunes [*R.A.M.*, xii, p. 180]. When buds or scions were taken from affected trees, the rough, corky thickening of the bark, with diamond-shaped excrescences at the sites of pruning cuts or cortical fissures, characteristic of the trouble, rapidly developed in the resultant growth if bark lesions were present in the parts used for propagation. On the other hand, propagative material of normal aspect taken from the same or other diseased trees induced no sign of the disorder on the stocks on which it was grafted during the period of eight years covered by the tests. In a few instances, when normal and cankered scions were inserted on opposite sides of the same non-susceptible Pomaceous stock, e.g., almond, peach, apricot, or plum, the disease appeared in the growth from the healthy grafts. It is concluded that diamond canker of Agen prunes (none of the other varieties tested was susceptible) is caused by a localized virus presenting certain analogies with citrus psorosis [ibid., xviii, p. 671 *et passim*].

Rawlins (T. E.) & Thomas (H. E.). **The buckskin disease of Cherry and other stone fruits.**—*Phytopathology*, xxxi, 10, pp. 916–925, 2 figs., 1941.

Among the more striking differences in the symptoms of cherry trees suffering from buckskin disease in the Green and Napa Valleys of California [*R.A.M.*, xix, p. 484] are, in the former, the apparently normal flower buds, conical dull-surfaced fruits, early and mid-season foliage practically normal on Mazzard stocks, severely chlorotic on Mahaleb (*Prunus mahaleb*); and, in the latter, ragged flower buds, normal-shaped fruits without marked superficial dullness, the leaves of older trees small and pale green on both stocks, numerous on Mazzard and sparse on Mahaleb. These differences are suggestive of the existence of distinct strains of the virus, more direct evidence in support of which was obtained from a test in which diseased Napa scions were grafted on four healthy cherry trees on Mazzard stocks in Green Valley. The symptoms developing on the inoculated trees were typical of those occurring in the Napa Valley, whereas fruits in the same plot on trees grafted with local inoculum showed the characteristic Green Valley features. The principal symptoms of the disease on peach, known as X disease or yellow-red virosis in other States, have already been described [loc. cit., *et passim*]. Apricots display no external signs of buckskin, though the virus was recovered from or passed through Blenheim apricot growing on diseased peach by inarching a healthy peach seedling on the apricot.

The examination of transverse sections of diseased peach stems revealed degeneration of the phloem tissues, the affected cells, usually

situated midway between the phloem rays, staining red with phloroglycinol in 18 per cent. hydrochloric acid. The leaves of peaches under glass are apt to develop pronounced vein-swelling, accompanied by the formation of schizogenous cavities at the junction of the lamina and vein, hypertrophy and hyperplasia in the phloem rays, parenchyma, and bundle sheath, and the deposition of a brown or yellow substance in phloem ray and bundle sheath cells. The abscission of chlorotic or purple areas along the margin of the lamina is preceded by the solution of the intercellular substance in a narrow zone surrounding them, outside which wound gum is formed and suberization is ultimately effected.

In field and greenhouse graft inoculation experiments with the buckskin virus, Napoleon cherry on Mazzard stock and Orange Cling peach provided the best sources of inoculum of those so far tested. In the field the incubation period of the disease ranges from a few months to several years, while a period of two months is ordinarily required for the development of infection in the greenhouse. Positive results were obtained with inoculum from sweet cherry on seedling, Seller's Orange, and Elberta peaches, and English Morello on Mazzard; from *P. demissa* on cherry and peach; and from peach on sweet cherry, Morello seedlings, *P. mahaleb*, and peach, but the last-named is inferior as a source of inoculum to sweet cherry and *P. demissa*. The Shalil peach variety and *P. mira* also proved susceptible to buckskin, while the virus was also recovered, in at least one instance, from almond on which the symptoms are often so indefinite as to preclude certain diagnosis. Plum varieties have hitherto shown no symptoms of the disease, but attempts at the recovery of the virus are not yet concluded. In preliminary experiments *P. cerasifera*, *P. marianna*, *P. subcordata*, and a number of other species proved to be highly resistant or immune.

Yarwood (C. E.). **Diurnal cycle of ascus maturation of Taphrina deformans.**—*Amer. J. Bot.*, xxviii, 5, pp. 355–357, 1 fig., 1 graph, 1941.

A study of the diurnal cycle of *Taphrina deformans* on peach trees in a natural environment in California was conducted by observing sections of infected leaves collected at different times of the day, by counting the spores caught on slides exposed periodically in infected trees, and by inducing spore discharge from diseased leaves collected at different hours. These three independent methods gave substantially identical results. The asci start to grow from the ascogenous cells in the evening, nuclear divisions occur at night, and spores mature the next day. Ascospores are naturally discharged most profusely in the evening, with a maximum discharge at about 8 p.m., i.e., several hours after morphological maturity has been reached. Ascospore discharge is stimulated by the vapours of formalin-acetic-alcohol acid fixative, but does not occur until after the spores are morphologically mature.

Reyneke (J.). **The final ripening period in relation to woolliness of Peregrine Peaches.**—*Sci. Bull. Dep. Agric. S. Afr.* 228, 19 pp., 2 graphs, 1941. [Afrikaans summary.]

In further studies at the Western Province Fruit Research Station, Stellenbosch, 'woolliness' in Peregrine peaches [*R.A.M.*, xix, p. 286]

was shown to be a continuation of the temporarily juiceless condition through which the fruit normally passes prior to reaching table-ripe maturity. Peaches placed in cold storage at this stage in their development will retain the 'woolly' texture, the persistence of which is brought about by the action of the low temperature on the cell-wall hydrolysing enzymes. The temporary juiceless condition is caused by a rapid decline in firmness during the final stages of ripening on the tree, precluding the mechanical rupture of the cells, the rupture of which by means of freezing restored juiciness in 'woolly' fruit. It was ascertained that fruit picked in the 'A' stage, i.e., when firm and juicy, without flavour, the ground colour green with a slight blush, developed 46·7 to 68·4 per cent. 'woolliness' after a week at 45° F., compared with 0 to 4·2 per cent. (slight) for that gathered at stage 'B', soft and juiceless, with the ground colour beginning to disappear and the peach taste just perceptible. In accordance with these observations, it is recommended that fruit intended to reach cold storage 24 hours after picking should not be gathered until the conclusion of the juiceless stage, and further, that fruit arriving at the docks before attaining a minimum content of expressible juice of ±30 c.c. per 100 gm. tissue should not be allowed to enter cold storage. The same minimum appeared to be requisite for the prevention of internal breakdown [ibid., xvii, p. 470], which is most prevalent in fruit picked at the 'A' and 'C' (soft and juicy, table-ripe) stages.

Cochran (L. C.) & Hutchins (L. M.). **A severe ring-spot virosis on Peach.**—Abs. in *Phytopathology*, xxxi, 9, p. 860, 1941.

In May, 1940, J. H. Hale and Late Elberta orchard peach trees showed twig blight and severe die-back, the current season's growth exhibiting dark, sunken areas of varying dimensions from spots to large cankers, while scattered leaves bore rings, yellow spots, and chlorotic patterns. In May, 1941, none of the symptoms was present on trees affected in 1940. On 15th May, 1940, J. H. Hale nursery peaches were grafted with scions from the severely affected orchard trees, and within two months sunken areas had developed in the bark on the grafted trees and the twig terminals in a vertical line above the points of grafting were dying back. By the following October extensive twig girdling and splitting and furrowing of the trunk bark had begun, and in the next year the onset of growth was much retarded and the initial, abnormally pale green leaves bore similar patterns to those observed in the orchard in 1940; the later foliage, developing after the abscission of the mottled leaves about the middle of May, appeared normal. Nursery trees of Ne Plus Ultra almond, myrobalan plum [*Prunus divaricata*], Mahaleb and Mazzard cherries, graft-inoculated from the diseased orchard peaches, developed ring spots and chlorotic and necrotic patterns in the foliage. Other tests demonstrated the existence of a virus group in stone fruits in California capable of producing symptoms in peach similar to those described above.

Anderson (H. W.). **Red stele root rot of the Strawberry.**—*Trans. Ill. hort. Soc.*, lxxiv, pp. 383–393, 1940. [Abs. in *Exp. Sta. Rec.*, lxxxv, 5, p. 636, 1941.]

The symptoms of red stele [core] root rot of strawberries and the

life-history of its agent, *Phytophthora fragariae*, are described, and various possible methods of control, based on studies of the disease in Illinois, are indicated. So far no case of infection has been observed on the Aberdeen variety [*R.A.M.*, xx, p. 482], the resistance of which is transmitted to a high proportion of its progeny.

WORMALD (H.) & MONTGOMERY (H. B. S.). **Leaf blotch of Strawberries.** —*Gdnrs' Chron.*, 3rd Ser., cx, 2864, p. 180, 1 fig., 1941.

Early in August, 1941, strawberries at Trottiscliffe, Kent, developed leaf blotches bearing the pycnidia of *Phyllosticta grandimaculans* [*R.A.M.*, vii, p. 700]. The same disease was ascertained to have occurred at Westerham, Kent, in February, 1939, and in several other localities in the same county. The smallest spots showed a grey, nearly white, centre, with a purplish border, and some bore fructifications of *Ramularia tulasnei* [ibid., xii, p. 705], the conidial stage of *Mycosphaerella fragariae*. Larger spots on the same leaves were similar in appearance, but had pale, yellowish-brown centres; they ranged up to 2 in. in diameter, the bigger ones taking the form of irregular blotches. The larger blotches had a small, pale brown centre, then a broad brown zone bordered by a narrow, dark purplish ring. Beyond this, the leaf surface was occasionally yellowish, the discoloration merging into the green of the healthy part. Subsequently, leaves were noted on which most of the surface was affected, the leaflets being crumpled and distorted. The *P. grandimaculans* fructifications, which were usually present on the brown parts surrounding the pale central spot, though occasionally found on the centre itself, measured 140 to 285 μ in diameter, and were somewhat lenticular; in a damp atmosphere they exuded a pale, glistening globule consisting of cylindrical spores measuring 5·5 to 7 by 1·5 to 2 μ, with rounded ends, and abstricted from conidiophores 12 to 15 μ long, lining the inner wall of the pycnidium. In distilled water at 18° C. they produced germ-tubes up to 30 μ long after 48 hours. Inoculations with the fungus have not yet been carried out. The disease appears to be much more destructive than the common leaf spot caused by *M. fragariae*. The suggestion is made that it should be referred to as strawberry leaf blotch.

WOOD (C. A.) & WHITEHEAD (T.). **Aphid transmission of Strawberry viruses.**—*Nature, Lond.*, cxlviii, 3759, pp. 597–598, 1941.

In tests at Bangor, North Wales, in 1940 and 1941 the virus of strawberry crinkle (*Fragaria* virus 2) [*R.A.M.*, xix, p. 717] was transmitted from Royal Sovereign strawberries to *Fragaria vesca* by *Pentatrichopus* [*Capitophorus*] *tetrarhodus* Walk., the resultant symptoms being indistinguishable from those produced by *P.* (*Capitophorus*) *fragariae*.

CHAMBERLAIN (G. C.). **A necrotic 'fern-leaf' mosaic of Raspberry.**— *Sci. Agric.*, xxii, 2, pp. 119–124, 2 figs., 1941.

In May, 1935, a single three-year-old Cuthbert raspberry stool in a plantation belonging to the Dominion Laboratory of Plant Pathology, St. Catherines, Ontario, showed symptoms suggestive of a new virus disease, which so far has not been recorded in commercial plantations.

Foliage mottling ranged from distinct yellow spotting and ring-spotting to extensive, coarse, well-defined pale green to yellow blotches; when extensive, it closely resembled the severe form of green mottle mosaic. Mottling became partially or entirely masked in midsummer, to reappear later. Necrotic spotting was extensive on the older basal leaves of newly infected canes, generally in association with the yellow spotting. Conspicuous cane and leaf stunting was present, and the bud development of fruiting canes was very irregular, some developing normally, others showing delayed foliation, and the remainder failing to grow. The berries from diseased canes were small, dry, seedy, and acid in taste.

In transmission tests, 122 patch grafts were made to young, healthy canes of different red and black varieties, with 90·1 per cent. successful transmission. Evidence was obtained that the disease is distinct from green mottle mosaic.

Simmonds (J. H.). **Latent infection in tropical fruits discussed in relation to the part played by species of Gloeosporium and Colletotrichum.**—*Proc. roy. Soc. Qd*, lii, 10, pp. 92–120, 6 pl., 1941.

In a study in Queensland of latent infection in tropical fruits mostly associated with species of *Gloeosporium* and *Colletotrichum*, it was shown that immature banana fruits inoculated in the field with *G. musarum* [*R.A.M.*, xix, p. 551] could remain in a latent state of infection for 5¼ months, after which period the fungus resumed activity to produce typical anthracnose lesions in the ripening fruit. Only a proportion of the original infections developed into spots on ripe fruit. Investigation into histological changes associated with latent infections of banana, papaw [see next page], and mango [ibid., xx, p. 27] fruits showed that a fine infection thread penetrates the cuticle direct from the appressorium and forms a hyphal structure adjacent to the cellulose wall of the epidermal cell. This subcuticular hypha is considered to be the form in which the fungus survives its period of latency. It is believed that the main function of the appressorium is to provide a firmly attached reservoir from which the infection thread may be produced. The appressorium is more resistant than the spore to certain chemicals and for that reason may be unaffected by some sprays. It is thought to be probably homologous with a chlamydospore, but in consideration of its function the use of the name appressorium is preferred. As an explanation of the absence of active parasitism in the green fruit, it is suggested that the outer cellulose layer of the epidermal wall acts as a barrier that the parasite is unable to overcome owing to the chemical nature of the wall or possibly the constitution of the cell sap at that time, and is, therefore, forced to remain dormant. Later, owing to the withdrawal of toxic substances or to an increase in enzyme action resulting from better nutrition and growth or alterations in the constitution of the cell sap, intercellular development becomes possible and rapid growth of the parasite follows.

Silberschmidt (K.) & Nobrega (N. R.). **Sôbre uma doença de virus de Bananeira.** [On a Banana virus disease.]—*Biológico*, vii, 8, pp. 216–219, 2 pl., 1941. [English summary.]

Bananas of the Gros Michel, Prata [Silver], Ouro [Gold], S. Tomé,

Nanica [Dwarf], Nanicão, Java, and Maranhão varieties at Campinas and Capital, São Paulo, Brazil, are affected by a mottling of the foliage in the form of alternate dark and light, unbroken or discontinuous stripes, starting from the midrib and extending to the margins; in some cases necrosis ensues. The leaves may present a wavy appearance, and in severe cases the lamina is much reduced. The disease may or may not be fatal, and it is noteworthy that both perfectly sound and infected plants may arise from the same rhizome.

Attempts to transmit the disorder from infected to healthy plants by mechanical means or planting diseased and sound bananas in the same container gave negative results, but the typical mosaic symptoms developed in one plant inoculated with the aid of the aphid *Pentalonia nigronervosa*, and infection was further conveyed through the juice of diseased bananas to White Burley tobacco, *N*[*icotiana*] *rustica*, and from these back to White Burley and also to *N. glutinosa*, *Datura stramonium*, and *Petunia* sp. From the symptoms induced by the banana mosaic in these experiments, especially on *N. glutinosa* and *P.* sp., it is tentatively referred to the *Cucumis* virus 1 group.

Symptoms resembling those of the diseased bananas were observed in a field of Java bananas on *Commelina nudiflora* [cf. *R.A.M.*, xiv, p. 615], *Stachys arvensis*, *Ageratum conyzoides*, *Amaranthus retroflexus*, and *Richardsonia brasiliensis*, inoculations with the expressed juice of all of which gave positive results on White Burley and Geudertheim tobacco, *N. rustica*, *N. glutinosa*, *D. stramonium* and *P.* sp.

Gonçalves-Silva (S.). **Doenças do Mamoeiro.** [Papaw diseases.]—*Biológico*, vii, 8, pp. 220–225, 1941.

The writer describes the symptoms and recommends measures for the control of the following diseases affecting papaws in São Paulo, Brazil: leaf spot (*Asperisporium caricae*), anthracnose (*Colletotrichum gloeosporioides*), powdery mildew (*Oidium caricae*) [*R.A.M.*, xx, p. 587], black rot (*Mycosphaerella caricae*) [ibid., xviii, p. 505], mosaic [ibid., xix, p. 642; xx, p. 565], and leaf spots caused by species of *Cercospora*, *Ascochyta*, and *Phyllosticta*.

Hedden (O. K.) & Merrill (R. M.). **Experiments in the use of vapour-spray equipment.**—*Circ. U.S. Dep. Agric.* 598, 20 pp., 5 figs., 2 diags., 1940. [Received November 1941.]

In comparative field trials carried out in the United States it was found that the water required for spraying fruit trees with the ordinary hydraulic sprayer in common use can be reduced from 1/3 to 1/2 by the use of a vapour-spray equipment [*R.A.M.*, xviii, p. 383] operated by an oil-burner. This economy was, however, offset by the cost of operating an oil-burner of suitable size. Some materials, such as phenothiazine, free nicotines, and Bordeaux proved entirely unsuitable for use in vapour-spray equipment, while free nicotines withstood the heat somewhat better, and sulphurs generally improved in fungicidal action and sticking qualities. It is believed, however, that under certain conditions some polysulphides injurious to foliage may be produced by incomplete chemical reactions of lime and sulphur while heated in the spray hose. Control of apple scab [*Venturia inaequalis*], cherry leaf

spot [*Coccomyces hiemalis*], and peach leaf curl [*Taphrina deformans*] with vapour-sprayed liquid lime-sulphur or inexpensive dusting sulphur made wettable was, in practically all cases, equal or superior to that obtained with a hydraulic sprayer. In addition, sprays irritating to the skin caused considerably less discomfort. All insoluble copper compounds tested were injurious to foliage when applied with the vapour-spray apparatus. The spray produced by it is finely divided, and has, therefore, the advantage of evaporating rapidly in damp weather. Under windy conditions, on the other hand, it does not carry quite as well as that produced by the hydraulic spray. It is concluded from these results that the use of vapour-spray apparatus for applying any of the materials used in spray schedules is apparently limited to fixed nicotines and sulphur compounds.

British Standard Specifications (A.R.P. series) [BS/ARP 56] for rot-proofing canvas, yarn and cordage, [BS/ARP 57] for the rot-proofed Jute, Hessian sandbags, [BS/ARP 58] for rot- and water-proofing of Jute canvas.—12 pp., British Standards Institution, 28 Victoria Street, London, S.W. 1. August, 1941. 2*d*. (post free 4*d*.) each.

The British Standard Specifications (A.R.P. series) BS/ARP 56, 57, and 58 for the rot-proofing treatment of textiles [*R.A.M.*, xx, p. 168] were prepared at the request of the Ministry of Home Security. (1) BS/ARP 56, relating to the protection of canvas, yarn, and cordage, deals with the application of (*a*) copper salts, (*b*) zinc salts, and (*c*) creosote-coal tar distillate. (2) BS/ARP 57 covers the preservation of jute and hessian fabrics (sandbags) by means of copper salts, copper-creosote, or creosote. (3) BS/ARP 58 specifies that jute canvas fabrics, before water-proofing, shall be rot-proofed either by the application of copper naphthenate or another approved medium, or by the use of cuprammonium/bitumen.

Chace (W. G.). **The storage of mold cultures.**—*Amer. Dyest. Rep.*, xxix, 17, pp. 429–430, 1940.

At the Lowell Textile Institute *Chaetomium globosum* [*R.A.M.*, xx, p. 587], *Aspergillus niger*, *A. fumigatus*, *A. glaucus*, and *A. wentii* (all from textiles except the first-named) were maintained in vigorous condition for three years by culturing on long slants of Czapek's agar in 8 by 1 in. tubes and allowing these cultures to attain a heavily sporulating condition in a 30° C. high humidity incubator, before transference to a large desiccator in which drying rapidly ensued.

Loos (C. A.). **A virus disease of Emilia scabra.**—*Trop. Agriculturist.* xcvii, 1, pp. 18–21, 1 pl., 1941.

Emilia scabra (a common weed), growing on marsh land in the Talawakelle district of Ceylon was observed, rather more than a year ago, to show a disease, characterized chiefly by yellow veinbanding, which has since become much more prevalent. No organism appeared to be associated with the condition, which was successfully transmitted to healthy *E. scabra* plants by grafting, and is regarded as being, probably, of virus origin.

Smith (K. M.) & MacClement (W. D.). **Further studies on the ultrafiltration of plant viruses.**—*Parasitology*, xxxiii, 3, pp. 320–330, 2 graphs, 3 diags., 1941.

Ultrafiltration studies [which are described] showed that *Lycopersicum virus* 4 (tomato bushy stunt), *Nicotiana virus* 11 (tobacco necrosis), and *N. virus* 12 (tobacco ring spot) all filtered in a consistent manner and appeared to have approximately spherical particles [*R.A.M.*, xix, p. 731]. In each case the filtration end-point was 40 mμ, from which a particle diameter of 13 to 20 mμ is calculated. The filtration curve of tobacco necrosis virus showed, however, a 'bench' or 'shelf', which suggests either a polydisperse system or some disymmetry in particle shape.

Difficulty was experienced in filtering *Nicotiana virus* 1 (tobacco mosaic) and its strains. A value of 13 to 20 mμ was found for the particle diameter of the type virus, but the evidence indicated that the infective units may vary considerably in length. With *Solanum virus* 1 (potato virus X), another rod-shaped virus which was also difficult to filter, the end-point was 100 mμ, with particle diameter calculated at 33 to 50 mμ.

McWhorter (F. P.). **Plant-virus differentiation by trypan-blue reactions within infected tissue.**—*Stain Tech.*, xvi, 4, pp. 143–148, 1 pl., 1 fig., 1941.

Trypan blue (0·5 or 0·05 per cent.) has been found effective in tests at the Oregon Agricultural Experiment Station for the demonstration of the presence of certain viruses, e.g., tobacco mosaic, bean [*Phaseolus*] virus 2, and tulip virus 1, in diseased tissues, the amorphous and crystalline inclusions ('viroplasts') constituting cytological evidence of infections of this type [*R.A.M.*, xx, p. 603]. Phloxine (0·5 per cent.) has been found useful for the pink or purplish staining of inclusions which do not absorb trypan blue. The reagents are made up in physiological salt solution (0·85 per cent. aqueous sodium chloride), and used with a suitable detergent, e.g., 1 per cent. O.T. 100 (vatsol).

White (D. P.). **Prairie soil as a medium for tree growth.**—*Ecology*, xxii, 4, 398–407, 6 figs., 1 diag., 1941.

The outcome of greenhouse experiments at the Soils Department, University of Wisconsin, definitely showed the early development of both conifers and hardwoods to be adversely affected by some inherent deficiency of the prairie soil samples collected from the southern part of the State. Chemical analyses failed to reveal sufficient grounds for the poor growth of the trees, the response of which to fertilizer treatments was likewise inadequate. In a comparative test initiated in the autumn of 1939 red and white pine (*Pinus resinosa* and *P. strobus*) seedlings grown from surface-sterilized seeds in virgin Carrington silt loam prairie soil formed sparse secondary roots with abundant root hairs and a few mycelial strands, but no mycorrhizal mantle, whereas seedlings of the same two species raised on a similar soil with the addition of 10 per cent. humus top soil produced vigorous laterals with profuse mycorrhizal growth on the secondary roots, besides making twice as much top growth as those in the untreated soil. The inocula-

tion of a sterile medium in Erlenmeyer flasks, each containing two *P. resinosa* seeds, with pure maize meal-sand cultures of the mycorrhizal fungus on the lines advocated by Melin [*R.A.M.*, ii, p. 77] resulted in improved growth both of the root systems and crowns [cf. ibid., xviii, p. 267]. It is suggested that mycorrhiza exert a specific growth-promoting effect upon forest seedlings, the absence of this stimulus being a major factor in the poor growth of trees on mycorrhiza-free prairie soils.

GRIEVE (B. J.). **Studies in the physiology of host-parasite relations.**—*Proc. roy. Soc. Vict.*, N.S., liii, 2, pp. 323–341, 1 pl., 2 figs., 1941.

In further studies in Melbourne on the development of adventitious roots in tomato plants infected by *Bacterium solanacearum* [*R.A.M.*, xviii, p. 789] it was found that such roots frequently developed ahead of advancing columns of bacteria in the vessels and continued developing to the stage where the root becomes visible as a nodule at the surface of the stem, even though the vessels nearest the incipient root became gradually blocked. Some experimental evidence pointed to the possibility that where the invading bacteria are present in large numbers, sufficient to block some vessels, the blocking effect may be an important factor in root formation.

Ether extractions gave no significant difference in the growth substance content of healthy and invaded stem parts, but the close parallel between the formation of adventitious roots in healthy plants by the application of β-indole-acetic acid and in infected plants indicated that growth substance was associated with the formation of these roots. Whether the pathogen or the host produces the growth substance is a matter of opinion, but the author considers that the evidence available indicates that it is produced by the host cells as the result of local stimulation by the bacteria. Comparable inoculations with *Aplanobacter michiganense* and *Bact. tumefaciens*, both reported to produce a growth substance in culture, showed that the former gave variable results while the latter induced fewer and less well-distributed roots than *Bact. solanacearum*.

SAKSENA (R. K.). **Thiamin and growth of some species of Pythium.**—*Proc. Indian Acad. Sci.*, xiv, 2, pp. 141–148, 1 pl., 1941.

In the writer's experiments at the University of Allahabad *Pythium arrhenomanes*, *P. deliense* [*R.A.M.*, xv, p. 244], *P. graminicola*, *P. hyphalosticton*, and *P. mamillatum* [ibid., xv, p. 109] were found to be capable of unlimited growth on a nutrient solution consisting of mineral salts and pure dextrose and containing no appreciable amounts of thiamin or its intermediates. The fungi were shown to be capable of synthesizing their own growth-promoting substance from the elementary ingredients of the nutrient solution, and did not perceptibly respond to the addition of thiamin B [ibid., xx, p. 591].

WAKSMAN (S. A.). **Antagonistic relations of microörganisms.**—*Bact. Rev.*, v, 3, pp. 231–293, 1941.

The author summarizes and critically discusses the literature on various aspects of the antagonistic inter-relationships of various groups

of micro-organisms, including human, animal, and plant pathogens; most of the contributions concerned with the last-named have been noticed from time to time in this *Review*. The bibliography comprises 373 titles.

Teakle (L. J. H.), Morgan (E. T.), & Turton (A. G.). **Experiments with micro-elements for the growth of crops in Western Australia. III. Experiments with Potatoes, vegetables, and other crops in the Albany District.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xviii, 2, pp. 96–125, 6 figs., 1941.

In further experiments carried out in Western Australia to determine the response of different crops to micro-elements used in addition to the ordinary basal fertilizers [see above, p. 68], tests were made with Delaware potatoes on summer land at Grasmere, Many Peaks, Little Grove, and Lake Saidie. The last-named is an area acutely deficient in copper, Little Grove is acutely deficient in manganese and copper, Grasmere has produced excellent crops of potatoes nearly every year for 40 years without special fertilizer treatments, and Many Peaks is virgin peat land. A factorial design was used in four instances, and a randomized block for collateral purposes. Copper sulphate, manganese sulphate, and zinc sulphate were applied, the first two each at 0, 5, 10, and 20 lb. per acre, the last-named at 0, $2\frac{1}{2}$, 5, and 10 lb. per acre. To cover all possible combinations, 64 different treatments were given, and those being triplicated, each experiment involved 192 separate plots. The crops planted included potatoes, tomatoes, peas, maize, swedes, and onions.

At Grasmere and Many Peaks no response in yield of potatoes was obtained from any micro-element or combination of elements. On the neutral, sandy, swamp soils of Lake Saidie and acidic bottlebrush [*Callistemon*] country potatoes, tomatoes, and maize gave excellent response to dressings of copper sulphate at 5 to 10 lb. per acre or more. No further improvement followed the application of other micro-elements. On the marly soils of Little Grove copper-containing fertilizers gave satisfactory yields of excellent tomatoes, but the addition of manganese was without any definite effect. With peas and swedes copper was also of the first importance, but further considerable improvement in yield resulted when manganese was used as well as copper. In the absence of copper, peas produced small, abortive pods or large pods containing tiny, abortive seeds. Potatoes failed to grow normally without manganese in the fertilizer mixture, but with manganese good yields of excellent tubers were obtained. The addition of copper further increased the yield, though copper without manganese was ineffective. It appears that in this district a soil dressing of 10 lb. of manganese sulphate plus 5 lb. of copper sulphate per acre should be used for potatoes. The use of zinc hastened the maturity of peas and swedes, but did not increase the yield of these crops.

It is concluded that certain soil types in the Albany district require the use of copper-containing fertilizers (5 to 10 lb. copper sulphate per acre) for the satisfactory growth of various crops, including potatoes, tomatoes, and maize. The best response is obtained from land that has deteriorated under previous crops, but a substantial effect is

observed on new land. A small dressing of copper sulphate may be advantageous in subsequent years. Certain marly soils require both copper and manganese. On these soils copper was of the first importance for tomatoes, and manganese for potatoes.

In one property at Lake Saidie all the potato plots receiving copper carried vigorous, thrifty-looking plants which withstood the dry summer conditions well, while the controls, given potato manure only, were dark green, stunted, and adversely affected by the summer weather. When the crop was dug, the control plot gave a low yield of misshapen tubers affected by a stem-end breakdown in which the flesh became of a soft, jelly-like consistency referred to as 'jelly-end rot'. Excellent yields were obtained from the copper-treated plots, but the quality was only fair.

When tomatoes were grown at Lake Saidie in soil treated with copper early growth was good, foliage normal, and fruiting satisfactory. The plants that received no copper made inferior growth, appeared unthrifty, and, in some cases, died out. The small amount of fruit they produced was of poor quality, the leaves were small and stiff, and the upper leaves rolled upwards, with the midrib as axis.

With maize at Torbay optimum results were given by copper sulphate applications of 10 lb. per acre. Growth was almost normal in the absence of copper sulphate on the sites of old ash beds, but on other parts of the untreated plots the maize did not grow beyond the seedling stage, developed pale yellow tipping of the leaves, poor roots, and weak stems, and finally collapsed in a rotting mass on the ground. Normal growth resulted where copper sulphate was applied.

Folsom (D.). **Results of testing some laboratory methods for possible use in the detection of virus diseases in Potato tubers.**—*Bull. Me agric. Exp. Sta.* 407, pp. 83–104, 1941.

The author describes 15 different laboratory methods of testing potato tubers for virus diseases, with regard to skin toughness, specific gravity, freezing injury, refractive index, copper-contact discoloration, and other reactions. Trials were carried out in Maine on the variety Green Mountain. In about 50 tests an average difference in measured characteristics was found to exist correlated with chronic infection (here meant as infection entering the parent plants through the seed pieces), but in about 90 tests no average difference was detected. Recent infection was correlated with an average difference in three tests, but not in 35 others. Average differences were more commonly observed with leaf roll and spindle tuber than with mild or rugose mosaics.

Nobrega (N. R.) & Silberschmidt (K.). **Estudos sôbre o estado sanitário de algumas variedades de Batatinhas peruanas.** [Studies on the sanitary condition of some varieties of Peruvian potatoes.]—*Biológico*, vii, 9, pp. 243–248, 2 pl., 1941. [English summary.]

The plants arising from the tubers of ten potato varieties collected in Peruvian native markets in 1940–1 and grown in São Paulo, Brazil, exhibited no symptoms of virus diseases, but the results of sap inoculation experiments from such plants on White Burley tobacco, *Nicotiana*

glutinosa, and *Datura stramonium* showed that four of the varieties under observation actually harboured viruses, that from the Serrana negra variety presenting analogies with the Y virus, while that in Mamada, Rosa, and Huanafana was apparently related to the X group [*R.A.M.*, xviii, p. 411].

Söding (H.) & Funke (Hildegard). **Ueber den Wuchsstoffhaushalt abbaukranker Kartoffeln.** [On the auxin economy of degenerate Potatoes.]—*Phytopath. Z.*, xiii, 4, pp. 351–368, 1 diag., 4 graphs, 1941.

In investigations on potato degeneration of virus origin at the Dresden Technical College the writers developed the following method of determining the plasticity of potato stems. Pieces of stem 10 cm. in length were weighed down for 30 seconds by a 5 gm. rider at a distance of 1·25 cm. from the tip, on the removal of which the stem sprang back, without, however, regaining its original position. The degree of inclination still persisting 15 minutes after release was measured with the aid of a horizontal microscope, the mean plasticity being computed from the values obtained for the upper and under sides of the stem, which may be widely divergent. By this means Stärkereiche [starchy] and Parnassia stems, the former suffering from leaf roll and the latter from a combination of mosaic and leaf roll, were found to be substantially less 'plastic' than that of healthy ones (40 as compared with 66 and 29 as against 74, respectively), whereas in the case of mosaic-infected Direktor Johanssen and especially Industrie the differences were inconsiderable. The diseased petioles of Parnassia, Stärkereiche, and Industrie were experimentally shown to respond less actively to treatment with dilute solutions of heteroauxin than healthy ones, thereby confirming the results obtained in previous trials by Hilde Lucas [*R.A.M.*, xix, p. 298]. The auxin content of half tubers of the above-mentioned varieties, with the addition of Odenwälder Blaue and Frühgold, was found to be consistently lower in diseased than in healthy material, the results being particularly clear-cut in regard to leaf roll.

Ark (P. A.). **The use of iodine in the control of Potato ring rot and scab.**—*Phytopathology*, xxxi, 10, pp. 954–956, 1941.

In experiments in California the immersion of cut potato seed pieces for three minutes in a 0·5 per cent. solution of iodine in 1 per cent. potassium iodide caused considerable injury and reduction in germination, besides failing to control ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*], which was, however, largely eliminated by dipping the cutting knife in 1 per cent. iodine [*R.A.M.*, xx, p. 275] before cutting each tuber. In a field test on the White Rose variety the incidence of ring rot following the use of a disinfected knife amounted to 5·3 per cent. of 225 hills, and there was a stand of 92 per cent., whereas failure to sterilize the knife resulted in 78·7 per cent. infection of 169 hills, with a reduction of the stand to 71 per cent. An effective formula for knife disinfection consists of 38 gm. iodine, 76 gm. potassium iodide, 1 pt. glycerine, and 2 gals. water. The knife should be wiped on a cloth before immersion to ensure the removal of the bacterial masses from the slime and tissue debris, which might otherwise protect them from contact with the antiseptic.

The scab [*Actinomyces scabies*] organism within the lesions was killed by five minutes' immersion of the tubers in 1 per cent. iodine, and in a field test on heavily infected whole Russet Rural seed potatoes only 2·5 per cent. of the tubers raised from the treated seed developed scab, compared with 47 per cent. in the control rows. In another test 8 per cent. of the tubers given one minute's treatment contracted infection, as against 69 per cent. of the controls. The five-minute treatment of whole tubers caused no decline in germination even after five months' storage.

The sclerotia of *Rhizoctonia* [*Corticium*] *solani* were not eliminated from Russet Rural tubers by the iodine method of disinfection.

Glick (D. P.). **Results of attempted eradication of bacterial ring rot from Potatoes.**—*Amer. Potato J.*, xviii, 5, pp. 140–143, 1941.

Using the microscopic method already described [*R.A.M.*, xix, p. 360], the writers in 1940 successfully eliminated bacterial ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*] from selected lots of nine out of ten potato varieties at the Colorado Agricultural Experiment Station, the exception being Katahdin, in which 9 out of 4,000 hills were infected.

Ruehle (G. D.). **A Xylaria tuber rot of Potato.**—*Phytopathology*, xxxi, 10, pp. 936–939, 2 figs., 1941.

Since 1936–7 potato tubers grown during the winter in the calcareous marl soils of southern Florida have been attacked by a species of *Xylaria* causing circular, sunken, sharply defined lesions, with pale tan centres shading to light brown at the margins, with the conspicuous black, simple or branched rhizomorphs, up to 3 mm. in thickness, adhering firmly to the surface of the tubers and acting as foci of infection. The fungus is characterized on the wood of willow [*Salix*], its normal host, by upright, solitary or pluricespitose, simple or rarely branched stromata, 0·5 to 8 cm. or more in length, sometimes furnished with stipes several cm. long, typically cream- to tan-coloured at the apiculate tips, shading to olivaceous-brown and then to black towards the base, where the surface is densely villose from the numerous dark hyphae arising from the surface, this character being lost as maturity approaches and replaced by undulations and prominent striations, presenting the aspect of fissured bark. Subhyaline to yellowish, continuous, fusiform to elliptical conidia, 6 to 7 by 2 to 3 μ, are copiously produced from the surface just below the tips. The cylindrical, hyaline, stipitate asci, 135 to 170 by 8 to 11 μ, each contain eight uniseriate, inequilaterally elliptical, brown, continuous or indistinctly septate spores with rounded ends, 16 to 25 by 4·5 to 7 (average 19·5 by 6) μ. The fungus, which E. West has tentatively identified with *X. apiculata*, makes luxuriant growth on potato dextrose agar. The inoculation of wounded potato tubers with cultures of the fungus resulted in a very slow rot similar to that observed in nature. Besides the willows growing in close proximity to the diseased potato crops, other kinds of rotten wood have also been found to harbour the fungus in various parts of the State.

KAWAMURA (E.). **Reaction of certain species of the genus Oryza to the infection of Piricularia oryzae.**—*Bull. sci. Fak. terk. Kyusu Univ.*, ix, 2, pp. 157–166, 1 pl., 1940. [Japanese, with English summary.]

The results of inoculation experiments with *Piricularia oryzae*, the agent of rice blast, on four species of *Oryza*, two with 24 and two with 48 chromosomes, showed that the former (*O. sativa* and *O. cubensis*) are susceptible, and the latter (*O. latifolia* and *O. minuta*) highly resistant. In the leaves of all the species infection was established by direct penetration of the hypha from an appressorium through the epidermal wall [*R.A.M.*, xix, p. 673], and the motor cell was most easily infected by this method. In *O. sativa* and *O. cubensis* there were no perceptible changes in the epidermal or motor cells, and the necrotic tissues were surrounded by wide venenate zones in which the chloroplasts were discoloured and disorganized. In *O. minuta* the necrotic cells were few and the venenate zones absent; in *O. latifolia* resinous deposits were accumulated in the intercellular spaces of the diseased tissues, in which no conidia developed even under favourable conditions. The F_1 progeny of *O. sativa* × *O. minuta* was equally resistant with the latter parent.

AGATI (J. A.), SISON (P. L.), & ABALOS (R.). **A progress report on the Rice maladies recently observed in central Luzon with special reference to the 'stunt or dwarf' disease : 1.**—*Philipp. J. Agric.*, xii, 2, pp. 197–210, 7 pl. (2 col.), 1941.

Three distinct sets of pathological symptoms were found to be present on the rice crops of central Luzon, Philippine Islands, inspected by the writers in 1940, viz., (1) stunted growth and general yellowing of the entire plant, common among late-sown stands in dry, sandy sites; (2) stunting and gradual desiccation and shrivelling of the leaves from the tip downwards, starting from the lower leaves and proceeding upwards, this form of the trouble usually occurring in localized patches; and (3) a yellowish-white or white, linear streaking of the upper young leaves. The individual stripes originate as dots or specks along the veins of an unfurled leaf but coalesce to form white, broken or continuous streaks, up to 1 mm. in width, in all except the oldest leaves. The affected leaves are short, narrow, and stiff, and the entire plant severely stunted, with correspondingly short internodes. Tillers are produced in abundance, but they are also stunted and streaked. This habit of growth results in a fan-like, crowded, or rosette-shaped crown. The mature leaves of diseased plants tend to thicken and develop a dark green coloration. Panicle formation is scanty or absent. The varieties affected by this relatively uncommon form of stunting or dwarfing, which appears to be new to the Philippines and similar to, or identical with, the Japanese 'dwarf' or 'stunt' disease [*R.A.M.*, xviii, p. 613], include Macan Bino, Dinalaga, Apostol, Azucena, Macan Santa Rosa, Tabuhan, strains 1 and 1*a* of Guinangang, and strains 1 to 4 of the Antipolo-Guinangang cross, undergoing field tests at the Maligaya Rice Experiment Station.

Form (1) of the disease complex under observation was found to be predominantly associated with poor, dry soil conditions, while (2) and

(3) were experimentally shown to be caused and transmitted, respectively, by the leafhopper *Nephotettix bipunctatus*.

MURRAY (R. K. S.). **Report of the Botanist and Mycologist for 1940.**—*Rep. Rubb. Res. Bd, Ceylon, 1940*, pp. 46–68, 1941.

In this report [cf. *R.A.M.*, xix, p. 673] the author states that the incidence of *Oidium* leaf disease [*O. heveae*] of *Hevea* rubber in Ceylon during the refoliation season of 1940 was exceptionally light in most areas, except at the highest altitudes. This was the result of almost unbroken hot, dry weather early in the year. In 1939, the corresponding period was also a dry one, but the minimum temperatures were then very low. This difference in temperature accounts for the fact that *O. heveae* was much more active, and caused more defoliation, in 1939 than in 1940. Observations were pursued on trees marked as possibly resistant, but the results obtained were negative, though the search for resistant trees is being pursued. A piece of land was secured at an elevation of some 1,500 feet, for the establishment of a large 'museum' collection of possibly resistant clones.

Root disease, chiefly due to *Fomes lignosus*, continues to cause trouble, necessitating expensive control measures in replanted clearings. The actual loss of plants seldom exceeds 1 per cent. of the total stand, and if the correct treatment (complete removal of the source of infection) is applied directly each fresh focus of infection is discovered, incidence markedly decreases in the third or fourth year after planting. Thus, the problem consists in reducing expenditure on control to a minimum, rather than in preventing excessive loss of plants. Several estates have made periodical inspections of the root systems of individual plants in order that sources of infection may be revealed and eliminated as soon as possible, but there was no evidence that the treatment paid for itself by reducing subsequent losses.

Several cases of a diseased condition just above the graft union of plants budded about 18 months previously were observed in replanted clearings. In advanced cases the bark was dead all round the stem for a distance of two or three inches above the union, but showed no external lesion. The affected plants showed distress in the foliage. No organism was associated with the condition, which may possibly be due to excessively moist conditions, though the damage may not become evident until dry weather later.

Many young buddings developed sun scorch of the union during hot, dry weather early in the year. In many cases, the damage was extensive owing to invasion by *Diplodia* [ibid., xii, p. 591], some estates losing hundreds of plants; unhealed unions should be shaded on the south and west sides.

BEWLEY (W. F.). **Practical soil sterilization with special reference to glasshouse crops.** *Bull. Minist. Agric., Lond.*, 22, iv+28 pp., 9 figs., 5 diags., 1941. 1*s.* 0*d.*

This is a reprint of the third edition of the bulletin with the same title originally published in 1931 [*R.A.M.*, x, p. 609], introducing slight amendments into the section on the 'Hoddesdon' system of steam sterilization to bring it up to date.

Wiehe (P. O.). **La morve rouge de la Canne à Sucre.** [Red rot of Sugar-Cane.]—*Rev. agric. Maurice*, xx, 4, pp. 198–202, 2 graphs, 1941.

Red rot (*Colletotrichum falcatum*) is stated to be one of the three principal sugar-cane diseases of Mauritius, the other two being gummosis [*Xanthomonas vasculorum*] and leaf scald [*Bacterium albilineans*]. On account of red rot the cultivation of such varieties as Bambou, Bois Rouge, Bellouguet, and DK/74 had long ago to be abandoned, while more recently the prolific and otherwise desirable M73/31 and Selangore Seedling have suffered the same fate. Discussing the combined influence of the periodicity of host growth and seasonal conditions on the development of the fungus, with special reference to the important industrial variety M134/32, the writer states that he observed up to 45 per cent. infection among one-year-old canes planted between September and mid-February, whereas those planted from April to July were quite free from rot.

Fawcett (G. L.). **El 'carbón' o 'tizón' de la Caña de Azúcar.** ['Smut' or 'blight' of Sugar-Cane.]—*Circ. Estac. exp. agríc. Tucumán* 100, 2 pp., 1 fig., 1941.

This is a popular note on the recent detection in the P.O.J. 36 sugar-cane plantations of Tucumán, Argentine Republic, of smut (*Ustilago sacchari*) [*U. scitaminea*: *R.A.M.*, xxi, p. 5]. Control should be based on the elimination of diseased material, either by roguing where only a few plants are infected, or by rotation with lucerne, maize, or some other non-susceptible crop in severe cases, while seed for new fields should be procured from healthy plantations.

Abreu (M. R.). **Results of a campaign against mosaic disease at Central Preston (Cuba).**—Communicated. [Abs. in *Sugar*, xxxvi, 11, p. 42, 1941.]

Since 1925, the mosaic-susceptible Cristalina sugar-cane variety, planted in Cuba [*R.A.M.*, xi, pp. 327, 603] over areas ranging from 9,500 to 16,000 acres, has been systematically rogued, with the result that the disease has practically disappeared from the Central Preston district, the number of stools per acre eradicated in 1940 being only 0·05 as compared with 12·76 in 1925. New plantings have consistently been made from carefully selected seed cane, which is also used for the refilling of gaps in ratoon crops.

Bruner (S. C.). **The diseases of Sugar-Cane.**—*Proc. As. Tec. Azúc. Cuba*, xiv, pp. 69–104, 1940. [Abs. in *Sugar*, xxxvi, 11, pp. 42–43, 1941.]

Mosaic is the most serious sugar-cane disease in Cuba, but it may be effectively combated by the use of resistant varieties, such as P.O.J. 2878, while even the old Cristalina, though susceptible, gives a satisfactory performance when healthy seed is planted on rich land [see preceding abstract]. P.O.J. 2878 and F.C. 916 are likewise resistant to eye spot [*Helminthosporium sacchari*: *R.A.M.*, xiii, p. 12], while the former and P.O.J. 2825 further withstand the very prevalent ring spot fungus [*Leptosphaeria sacchari*], which causes heavy damage to Crista-

lina. Brown stripe [*Cochliobolus stenospilus*: ibid., xx, p. 425] sometimes attacks P.O.J. 2878 severely, but is otherwise of little importance, and brown spot [*Cercospora longipes*] is injurious only to Co. 281. Certain Cuban and Puerto Rican canes have sustained extensive damage from target blotch [*H.* sp.], to which the standard varieties, however, are highly resistant. Other diseases of minor importance include pokkah-boeng [*Gibberella fujikuroi*], twisted top [ibid., xii, p. 328], rind disease [*Pleocyta sacchari*: ibid., vi, p. 509], root disease [associated with a complex of adverse growth factors: ibid., xi, p. 327], and red stripe [*Pseudomonas rubrilineans*].

Petrak (F.) & Esfandiari (E.). **Beiträge zur Kenntnis der iranischen Pilzflora.** [Contributions to the knowledge of the Iranian fungus flora.]—*Ann. mycol., Berl.*, xxxix, 2–3, pp. 204–228, 1941.

The following are among the items included in this critically annotated list of 136 Iranian fungi, of which eight are new to science: *Peronospora arborescens* on opium poppy [*R.A.M.*, xviii, p. 140], *Kuehneola* [*Cerotelium*] *fici* on figs [ibid., xx, p. 136], *Puccinia graminis* on barberry (*Berberis integerrima*), *P. pruni-persicae* on peach [ibid., xv, pp. 236, 609], *Uromyces fabae* on broad bean, *U. trifolii* on red clover (*Trifolium pratense*), *Leveillula* [*Oidiopsis*] *taurica* on *Catalpa speciosa* and other hosts, *Mamianiella coryli* on *Corylus avellana*, *Massariella palmarum* on date palm, *Pseudopeziza medicaginis* on lucerne, *Ascochytella piricola* [ibid., xiii, p. 493] (syn. *Ascochyta piricola*) on living apple leaves, *Botryodiplodia malorum* [*Physalospora mutila*: ibid., xvii, p. 69] on medlar, *Cytospora chrysosperma* on poplar (*Populus nigra*) [ibid., xix, p. 623], *Septoria graminum* [ibid., xviii, p. 297] on wheat, *S. mori* [*Cercosporella maculans*] on mulberry [ibid., xv, p. 67], *S. piricola* [*Mycosphaerella sentina*] on pear, *S. populi* on poplar (*P. nigra*) [ibid., xvii, p. 83], *Cercospora circumscissa* [ibid., xix, p. 582] on almond, *C. kaki* on *Diospyros lotus* [ibid., xvii, p. 699], *C. punicae* on pomegranate [ibid., ix, p. 613], *Polythrincium* [*Dothidella*] *trifolii* on white clover (*T. repens*) [ibid., xx, p. 583], and *Stigmina platani* [*Mycosphaerella stigmina-platani*] on *Platanus orientalis* [ibid., xvii, p. 492].

Garcés-Orejuela (C.). **Estudios micológicos colombianos. Dothideales.** [Colombian mycological studies. Dothideales.]—*Caldasia, 1941*, 2, pp. 75–87, 18 figs., 1941.

Included in this critically annotated list of 19 Dothideales of Colombia, comprising one new genus, *Phaeotrabutia*, designed to accommodate the black-spored species of *Trabutia* [cf. *R.A.M.*, xvii, p. 347], and seven new species, are *Phyllachora maydis* on maize [ibid., xi, p. 225] and *P. gratissima* on avocado [ibid., ix, p. 230].

White (W. L.). **A monograph of the genus Rutstroemia (Discomycetes).** —*Lloydia*, iv, 3, pp. 153–240, 75 figs., 1941.

Rutstroemia, as here maintained, is a small genus of saprophytes, apparently confined to Europe and North America. It is of interest because its species may be confused with the Amenticolous species of *Ciboria* and certain foliicolous representatives of *Sclerotinia*. The species form stromata which appear as black lines in woody tissues, leaf petioles, and veins, and spermatia in minute, black, lenticular

spermogonia. The apothecia are produced in late summer or early autumn, and are firm and waxy, coriaceous, and prosenchymatous, with a middle gelatinous zone in the excipulum. The ascospores become uni- to pluriseptate at maturity. No species of *Rutstroemia* produces real conidia. Twenty-one species are treated in detail; the descriptions of 21 other accepted species are reproduced, and twelve are listed as excluded from the genus.

GREENE (H. C.). **Notes on Wisconsin parasitic fungi. I.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxii, pp. 77–83, 1940.

Brief descriptive notes are given on parasitic fungi collected in Wisconsin during 1938, including *Piggotia fraxini* on leaves of ash (*Fraxinus americana*) [*R.A.M.*, xxi, p. 54] forming large, isolated, circular, dull purplish-green spots up to 1 cm. in diameter, *Phleospora mori* [*Cercosporella maculans*] on mulberry (*Morus rubra*) [ibid., xv, p. 67], *Sphaeropsis ellisii* [*Diplodia pinea*] on Austrian pine (*Pinus laricio* [*P. nigra*] var. *austriaca*) [ibid., xviii, p. 57; xx, pp. 150, 340], and *Melanconium sphaeroideum* apparently parasitic on alder.

MILLER (J. H.). **The Ascomycetes of Georgia.**—*Plant Dis. Reptr, Suppl.* 131, 93 pp., 1941. [Mimeographed.]

This is the first published list of the Ascomycetes of Georgia, United States; it comprises 221 genera and 761 species, based mostly on the collections of the author and his students during the last twenty years. He regards as mainly correct the names recorded for the recently monographed Operculate Discomycetes, also for *Dasyscypha*, *Lachnum*, *Lophodermium*, Hysteriales, Hypocreaceae, Diaporthaceae, and Xylariaceae; but many of the names recorded for other groups, such as the Allantosphaeriaceae, he regards merely as 'temporary expedients'. He recognizes four orders of Pyrenomycetes: the first two, Lophiostomales and Sphaeriales, have their asci and free paraphyses in 'true perithecia with definite walls and ostioles'; and the second two, Pseudosphaeriales and Dothideales, have their asci in stromatic locules.

The Lophiostomales, represented by the family Lophiostomataceae (eight species), include perithecial forms with a compressed ostiole and constitute a connecting link with the Hysteriales. The Sphaeriales comprise five families, Hypocreaceae, Xylariaceae, Allantosphaeriaceae, Diaporthaceae, and Phyllachoraceae, of which the last has been transferred from the Dothideales. *Anthostoma* and *Anthostomella*, genera with immersed perithecia and phaeosporous ascospores, are transferred from the Xylariaceae to the Allantosphaeriaceae. The Diaporthaceae [see next abstract], which is here enlarged to include both simple and stromatic genera, comprises 99 Georgian species in 19 genera, among them *Diaporthe*, *Endothia*, *Glomerella*, *Gnomonia*, *Melanconis*, and genuine *Valsa*, which is transferred from the Allantosphaeriaceae.

The Pseudosphaeriales [comprising the single family Pseudosphaeriaceae] are characterized by asci lying 'among interthecial threads or paraphysoids connected at the top and bottom of the locule', and include 153 Georgian species in 46 genera, among them *Botryosphaeria*, *Dibotryon*, *Didymella*, *Leptosphaeria*, *Ophiobolus*, *Parodiella*, *Physalospora*, *Pleospora*, *Pyrenophora*, and *Venturia*.

The Dothideales are now characterized by 'fasciculate asci arising from a central plectenchyma at the base of the cavity' and comprise the Dothideaceae, including *Dothidea* and *Dothidella* and, by transfer, the Mycosphaerellaceae, including *Didymellina*, *Guignardia*, *Mycosphaerella*, and *Pseudoplea*.

Wehmeyer (L. E.). **A revision of Melanconis, Pseudovalsa, Prosthecium, and Titania.**—viii+161 pp., 11 pl., Ann Arbor, The University of Michigan Press; London, Humphrey Milford, Oxford University Press, 1941. $2.50.

Dr. Wehmeyer is revising the stromatic Pyrenomycetes genus by genus, and, so far as material is obtainable, species by species. This book is a continuation of the author's well-known studies on 'The genus *Diaporthe* Nitschke and its segregates' [*R.A.M.*, xiii, p. 270].

Of the 60 species that have on occasion been called *Melanconis*, 25 are here accepted as good, and 27 excluded into seven other genera; material of eight has not been available. As finally presented, the genus comprises species with uniseptate ascospores, both hyaline and brown, appendaged and unappendaged, and with A-conidia, both hyaline and brown and from 0- to multiseptate.

Similarly, of the 37 species that have been placed in *Pseudovalsa* three are accepted as good, and the others excluded; seven with appendaged ascospores are transferred to *Prosthecium*, and one with one-spored asci to *Titania*.

Calospora of Saccardo's usage is suppressed, and its 40 species otherwise distributed, the type species to *Prosthecium*.

Melanconis, *Pseudovalsa*, *Prosthecium*, and *Titania* all agree with *Diaporthe* in finally filling the lumen of each perithecium with a mass of unattached asci; but the author does not commit himself to the thesis that this character calls for the erection of a family Diaporthaceae [see preceding abstract]. Some species that on occasion have been placed in *Melanconis* and *Pseudovalsa* or *Calospora* differ from all of them in the fact that their asci are permanently separated from one another by numerous filiform, persistent paraphyses, and are here referred to *Aglaospora*, *Massaria*, *Thyridaria*, or *Pseudotrichia*. Again, the author is not satisfied that they should accordingly be grouped in a special family Pseudosphaeriaceae [loc. cit.].

McKinney (H. H.) & Hills (C. H.). **Mosaic, chlorosis and necrosis in virus-infected perennial Pepper caused directly by products of a deranged metabolism.**—*Science*, N. S., xciv, 2442, pp. 372–373, 1941.

In a study of mosaic (*Nicotiana* virus 1) in perennial pepper (*Capsicum frutescens*) [*R.A.M.*, xvii, p. 773], the level of virus concentration was found to be relatively low under all conditions of growth. When the leaves were wiped with virus, local necrotic lesions developed and the leaves abscissed. When the inoculated plants were cultured at a temperature near 32° C. (but not near 23°), small quantities of virus passed from the inoculated leaf, causing systemic infection, with necrosis of the branches, stems, and roots, and finally death, old plants being more resistant than young ones. Before abscission a secondary chlorosis usually developed in the leaf tissues outside the local infections. Of

the 125 lots of leaf tissue isolated over a period of five years from outside the inoculated zones before and during the progress of secondary chlorosis, none showed the presence of virus when tested. When inoculated woody chilli plants were cultured at near 32°, typical fully developed light and dark green mosaic mottling frequently appeared on new leaves remote from the inoculated areas, persisting sometimes for several days before necrosis set in. Virus was detected on the first signs of necrosis, but not before. The greatest concentrations of the virus could be found in or very near the necrotic cortex or cambium, while none was detectable in the necrotic xylem of the stem. When plants, maintained at near 32°, were inoculated in the lower stem or the upper part of the tap-root, necrosis, leading to wilting of the plants, occurred considerably in advance of the virus in the xylem, but not in the cortex. It was found that very chlorotic leaf tissues contained larger amounts of peroxidase and smaller amounts of oxidase and catalase than normal leaves on the same branches, indicating that the virus is capable of inciting profound changes in tissues remote from the virus-containing zones. It is concluded from these observations that the secondary chlorosis, the mosaic mottling, and the xylem necrosis are induced directly by translocated or diffused products of a deranged metabolism, which, in turn, is induced by relatively small amounts of virus in remote zones.

Silberschmidt (K.) & Kramer (M.). **A possibilidade da transmissão de doenças de virus pelas pulverizações com extratos de Fumo.** [The possibility of virus disease transmission by spraying with Tobacco extracts.]—*Biológico*, vii, 8, pp. 207–215, 2 figs., 1 graph, 1941. [English summary.]

When tobacco plants at the Experiment Station of the Biological Institute, Campinas, São Paulo, Brazil, were treated against insect pests with nicotine sulphate or extracts of tobacco powders (prepared by soaking in cold water for 24 hours, with or without subsequent concentration by heating), mosaic symptoms developed only as a result of accidental contamination, whereas in those sprayed with the expressed juice of diseased plants at a dilution of 1 per cent. contracted over 50 per cent. infection. There would thus appear to be little risk of transmission of the tobacco mosaic virus from the use of home-made extracts of powders of the type under discussion.

Karthaus (J. P.) & Thung (T. H.). **Het verenten van Tomaten op voor slijmziekte resistente onderstammen.** [The grafting of Tomatoes on stocks resistant to slime disease.]—*Natuurwet. Tijdschr. Ned. Ind.*, ci, 9, pp. 266–270, 3 figs., 1941.

With a view to their use as stocks for the grafting of tomatoes in the Buitenzorg district of Java, where slime disease (*Bacterium solanacearum*) is a limiting factor in production, a number of other Solanaceae were tested for their reactions to the pathogen in heavily infested soil at an altitude of 1,200 m. above sea-level. In preliminary trials in 1933–4, *Solanum torvum*, *S. mammosum*, and *S. aculeatissimum* showed a very high degree of resistance, all contracting only 1·7 per cent. infection compared with 55·2 per cent. for the commercial Wonder of

the Market tomato variety, the corresponding figures for *S. macrocarpum*, *Cyphomandra betacea*, *S. quitoense*, and eggplant (*S. melongena* var. *breviviolaceum*) being 3·3, 3·4, 6·7, and 18·2 per cent., respectively, and for the controls, consisting of interspersed rows of Eigenheimer potatoes, 98·5 per cent. In a large-scale grafting experiment in 1940 with *S. torvum* and other Solanaceae, including *S. mammosum*, *S. macrocarpum*, and *C. betacea*, the first-named gave the most encouraging results, the percentage of mortality in three separate tests involving 218 plants being only 10·6 per cent. The fruit of the grafted Wonder of the Market plants was of an agreeable aromatic, sufficiently acid flavour, in contrast to the insipidity of that of the same variety on eggplant stocks. The sole drawback of *S. torvum* as a stock is the relatively lengthy period of 2½ months required for the seedlings to reach a large enough size for this purpose. A species of *Cercospora* apt to attack the older leaves of the stock in damp weather may be combated by spraying with 1·5 per cent. Bordeaux mixture.

Bewley (W. F.). **Tomatoes: cultivation, diseases and pests.**—*Bull. Minist. Agric., Lond.*, 77, iv+78 pp., 4 figs., 1941. 2*s.* 0*d.*

The present (seventh) reprint of the bulletin of the same name, originally published in 1934 [*R.A.M.*, xiii, p. 659], introduces certain rectifications in the statistical information and other revision suggested by the experience which is constantly accumulating at the Cheshunt Experimental and Research Station.

Shapovalov (M.), Blood (H. L.), & Christiansen (R. M.). **Tomato plant populations in relation to curly-top control.**—Abs. in *Phytopathology*, xxxi, 9, p. 864, 1941.

Severe outbreaks of curly top are stated frequently to reduce the Utah tomato crop by over 50 per cent. During the past five years the writers have conducted experiments involving a modification of the customary planting density of 3,560 plants per acre with a 3½ ft. spacing between the hills. The reduction in the incidence of infection in the densest plantings of quadruple populations ranged from 4·4 to 30 per cent., with a corresponding yield increase of 2·9 to 9·6 tons per acre. With a given number of plants per acre, somewhat better control of curly top was secured by setting two plants in each hill instead of single-plant hills more closely spaced, though the latter tended to give higher yields.

Colquhoun (T. T.). **Black dot root rot of Tomatoes.**—*J. Agric. S. Aust.*, xliv, pp. 572–575, 2 figs., 1941.

Tomato black dot root rot (*Colletotrichum atramentarium*) [*R.A.M.*, xix, p. 49] having caused considerable trouble in commercial glasshouses near Adelaide in 1935, an experiment was conducted (under commercial glasshouse conditions) which showed that leaving the soil roughly dug for 2½ months in summer reduced the percentage of affected plants to 69·7, as compared with 83·5 for plants grown in roto-tilled soil left for the same period. Moisture had no effect. In a further test the fungus remained viable for at least 11 months in both moist and dry soil, in the absence of host plants.

Champlin (S. H.). **Tomato experiments support belief that variety reduces overtime pack.**—*Canning Age*, xxii, 5, pp. 255–257, 15 graphs, 1941.

In connexion with a series of observations on the yield characteristics and average weight of 25 canning tomato varieties at different stages of ten bearing weeks in Virginia in 1940, it is mentioned that a week's spell of hot weather in July resulted in an attack of blossom-end rot [*R.A.M.*, xx, p. 3], which is attributed to inadequate transfer of moisture from soil to plant when high temperature and low humidity induce excessive evaporation. The sole practicable remedy appears to consist in a system of overhead irrigation forming a mist over the plants to prevent evaporation from the foliage.

Collins (C. W.). **Studies of Elm insects associated with Dutch Elm disease fungus.**—*J. econ. Ent.*, xxxiv, 3, pp. 369–372, 1941.

According to unpublished observations by T. H. Jones and C. S. Moses, *Ceratostomella ulmi* was obtained from 6·9, 5·8, 7·7, and 5·71 per cent. of the *Scolytus multistriatus* beetles and from 4·3, 2·4, 3·3, and 0·7 per cent. of *Hylurgopinus rufipes* collected on felled healthy elm trees in New Jersey [*R.A.M.*, xv, pp. 327, 691, and below, p. 106] and cultured in 1936, 1937, 1938, and 1939, respectively. Of numerous other species of insects taken in 1936, only small percentages of the following were contaminated by the fungus: *Xylosandrus germanus* (Blfd), *Xylobiops basilare* (Say), *Magdalis armicollis* (Say), and *Conotrachelus anaglypticus* (Say). Particulars are given of the methods employed by the beetles in boring into the trunks and limbs of elm trees, their breeding and feeding habits in relation to the transmission of *C. ulmi*, and the possibilities of control by means of insecticides, all these observations forming a part of researches on the Dutch elm disease in which the Morristown, N.J., laboratory of the Bureau of Entomology and Plant Quarantine is at present engaged.

Howard (F. L.). **Antidoting toxin of Phytophthora cactorum as a means of plant disease control.**—*Science*, N. S., xciv, 2441, p. 345, 1941.

The toxic effect of filtrates of liquid media in which *Phytophthora cactorum* [*R.A.M.*, xx, p. 326] had grown, was inactivated, in experiments at Rhode Island, by the addition of 0·5 per cent. aqueous solution of the di-hydro-chloride salt of di-amino-azo-benzene plus a solvent and penetrant ('helione orange'). Thus, healthy maple [*Acer*] trees injected with the toxic filtrate died, while those injected with the same filtrate to which the salt had been added remained unharmed. Over 350 confirmed maple trees naturally infected with *P. cactorum* stopped 'bleeding' and markedly improved in growth when injected with the antidoting chemical. It is not yet clear whether the trees were definitely cured, but the results are taken to indicate some possibilities of practical disease control.

Wright (E.). **Control of damping-off of broadleaf seedlings.**—*Phytopathology*, xxxi, 9, pp. 857–858, 1941.

In field and greenhouse trials in Federal nurseries in the Great Plains

region of the United States, damping-off of broad-leaved tree seedlings, chiefly due to *Rhizoctonia* [*Corticium*] *solani* and *Pythium ultimum*, tended to be more severe following legumes than in succession to cereals. Chemical analyses for soluble (nitrate) nitrogen indicated that the incidence of infection increased in direct proportion to the nitrate content of the soil. For the best nursery results the preceding crops should be turned under at least a month before the tree seed is sown. A heavy reduction in the amount of damping-off was secured by the application of glucose to the seed-bed at sowing time, a final American elm (*Ulmus americana*) stand of 293 per cent. being obtained on treated as compared with control plots of sandy loam, while soil analyses made a fortnight after the treatment showed a marked decrease in nitrate nitrogen. The addition of sugar to the soil probably accelerates the growth of soil organisms, including fungi which utilize or bind the nitrates until the carbon source is depleted.

Davis (K. P.) & Moss (V. D.). **Blister rust control in the management of Western White Pine.**—*Sta. Pap. north. Rocky Mtn For. Range Exp. Sta., Nissoula*, 3, 34 pp., 22 figs. (2 col.), 1 map, 1940. [Mimeographed.]

In this paper the authors discuss some practical silvicultural problems connected with the control of blister rust [*Cronartium ribicola*: *R.A.M.*, xx, p. 435] in the white pine [*Pinus monticola*] stands of the Inland Empire (Washington, Montana, and Idaho) by the suppression of the alternate *Ribes* hosts of the rust. Special emphasis is laid on the necessity of close integration of control measures with timber management. In particular, the cutting and slash disposal methods adopted in mature stands have a direct influence on the *Ribes* population. Good practices are those providing for prompt re-stocking of white pine, permitting a minimum number of *Ribes* seedlings to become established. Stand improvement in immature stands requires consideration from the point of view of infection conditions. Low type thinnings are the least desirable from the standpoint of *Ribes* suppression, whereas crown thinnings do not affect the *Ribes* problem adversely. Disease endurance of forest stands is of prime importance in relation to economic value, *Ribes* suppression, and probable rust damage. Any areas selected for protection should have an estimated production of at least 8,000 to 10,000 board ft. per acre. It is important to think in terms of board ft. production of western white pine rather than the number of *Ribes* bushes per acre or the percentage of infection of white pine. Anticipated damage must always be weighted against cost of control, and it is not essential that the disease be kept completely out of a stand provided the damage does not cause a reduction of normal yield or quality. Age, species composition, stand density, and likelihood of infection are the chief factors determining the amount of damage that the disease will cause, and the great need for more information on blister rust-timber management relationships is stressed.

Zentmyer (G. A.). **Cytospora canker of Italian Cypress.**—*Phytopathology*, xxxi, 10, pp. 896–906, 2 figs., 1 map, 1941.

Columnar Italian cypresses (*Cupressus sempervirens* var. *stricta*) along

a narrow belt of the Californian coast have been suffering during the last twelve years from a disease involving the development on the trunk and branches of reddish-brown cankers, smooth in the early stages, later becoming cracked and distorted with a heavy flow of resin, and bearing on their surfaces erumpent stromata, 0·5 to 1 mm. in diameter and 0·25 to 0·5 mm. in thickness, with 4 to 7 radiating locules, 300 to 600 μ in diameter, and greenish-grey, truncate ostioles protruding through the epidermis. The foliage of affected trees turns yellow, subsequently brown, persisting on the branches for some time after death in the form of 'flags' strongly contrasting with the normal green colour of the leaves. A 25-ft. tree has been observed to bear up to 30 cankers, and cypresses 30 ft. high and 6 in. in diameter at the base have succumbed to the disease within a year after the ingress of the pathogen by natural means. In an area less than $\frac{1}{2}$ mile square in the Berkeley district, in which 32 out of 62 trees were diseased in 1936, 20 had been removed on account of the canker by 1938, while 29 of the remaining 42 were infected. The increase in length of 12 natural cankers from 18th July to 17th October, 1937, ranged from 4·5 to 32 cm. with an average of 14·7 cm. The high mortality from the canker and the unsightliness of the diseased trees is leading to the gradual abandonment of *C. sempervirens* var. *stricta* as an ornamental species in the affected area, and its replacement by a suitable substitute for formal planting is likely to present considerable difficulties.

The causal organism of the canker, other less important hosts of which are *C. sempervirens* var. *horizontalis*, *C. macrocarpa*, and *C. glabra*, is a new form, *littoralis*, of *Cytospora cenisia* Sacc., characterized by few locules in the stroma. The caespitose, simple or branched conidiophores, 8·5 to 15 by 1·5 to 2 μ, bear hyaline (strontian yellow in the mass), allantoid conidia 3 to 7·2 by 0·6 to 1·5 (4·6 by 1) μ. The minimum, optimum, and maximum temperatures for the growth of the fungus in culture were determined as approximately 1°, near 19°, and 25° C., respectively, its low temperature requirements being apparently related to its known occurrence only in the cool coastal zone of California.

Control should be based on the avoidance of wounds, the protection of pruning cuts with Bordeaux or asphalt paints, and the stringent exclusion of diseased nursery stock from non-infected areas.

Rankin (W. H.), Parker (K. G.), & Collins (D. L.). **Dutch Elm disease prevalent in bark beetle infested Elm wood.**—*J. econ. Ent.*, xxxiv, 4, pp. 548–551, 1941.

The following are among the conclusions drawn by the writers from the results of an examination of a special series of dead elm wood samples collected in six counties of New York in 1939–40 to determine the frequency of *Ceratostomella ulmi* as a saprophyte in association with the bark beetles *Scolytus multistriatus* and *Hylurgopinus rufipes* [see above, p. 102]. The saprophytic existence of the fungus is neither a newly acquired habit nor a temporary one dependent for its continuance on the parasitic phase, since the presence of elms killed by the disease is not necessary to replenish the supply of fungus-carrying beetles in a given locality. *C. ulmi* appears to be migrating into new

territory in its saprophytic stage, the percentage of samples containing fungus-carrying beetles being as large at the margin of advance into a new region as in one where infection has been present for several years. The rate of lethal infection of living elms (an annual average of one diseased tree per five square miles for Orange County) is regarded as very low considering the number of sources of spread, the numbers of beetles carrying the pathogen on emergence from such sources, and the number of actual inoculation points made by the insects in living elms. Spread of the fungus to increasing numbers of living elms by parasitic activity alone, thereby inducing an epiphytotic build-up calculated to kill off the species, is considered to be no longer a justifiable expectation. Conversely, intensified local outbreaks have been found to be definitely connected with beetle-infested material produced by factors independent of the parasitic stage in the life-history of *C. ulmi*.

The annual incidence of elms destroyed by *C. ulmi* is thought to be largely dependent on a low rate of successful infection originating from the current volume of bark beetle breeding material produced by the combination of all factors involving the death of the wood or trees.

Baechler (R. H.). **Resistance to leaching and decay protection of various precipitates formed in wood by double diffusion.**—*Proc. Amer. Wood Pres. Ass.*, xxxvii, pp. 23–31, 2 figs., 1941.

The writer fully describes a series of experiments at the Forest Products Laboratory, Madison, Wisconsin, to determine (1) the possibility of precipitating materials of very low solubility in wood by a two-stage diffusion treatment, and (2) the resistance to leaching and the toxicity to wood-destroying fungi of certain substances thus formed. In preliminary tests on 15-in. lengths of green aspen [*Populus tremuloides*] fence posts, 4 in. in diameter, steeped for five days in copper sulphate and then transferred to a 20 per cent. solution of sodium chromate for a similar period, the absorption of each salt was found to amount to roughly 3 per cent. of the dry weight of the wood. When the order of treatment was reversed, a marked deficiency of copper sulphate resulted. Similarly, in other combinations, when the wood was first treated with the salt of a heavy metal (magnesium, copper, or nickel), subsequent penetration by sodium arsenate or sodium chromate was comparatively rapid, whereas the prior application of the sodium salts greatly retarded the infiltration of the heavy metals.

The outcome of leaching trials on (*a*) basswood [*Tilia*] blocks, 2 by 1 by 0·6 in., and (*b*) sections of green maple [*Acer*] fence posts, 6 in. in diameter with a 2-in. band of sapwood, showed that the chromates and arsenates of copper and nickel and magnesium ammonium arsenate, formed in the wood by the successive steeping method, are leached out more slowly than are soluble salts. The loss of weight in these blocks following four months' exposure to pure cultures of the fungus known as Madison 517 [? *Polyporus tulipiferus*: *R.A.M.*, xx, p. 188], *Coniophora cerebella* [*C. puteana*], *Poria incrassata*, and *Lenzites trabea* by a modification of the Kolle flask method was as follows: copper sulphate+sodium arsenate, 0·37, 0·48, 16·8, and 0·06 per cent., respectively; nickel sulphate+sodium arsenate, 1·27, 1·14, 10·6, and 14·2; copper sulphate+sodium chromate, 3·55, 11·6, 27·3, and 5·24; nickel

sulphate+sodium chromate, 8·35, 16·9, 19, and 23·5; copper sulphate, 6·67, 32·5, 19·4, and 0·71; nickel sulphate, 13, 39·3, 19·7, and 58; sodium arsenate, 26·3, 2·3, 20, and 51·2; sodium chromate, 31·8, 35·4, 34·7, and 42·1; zinc chloride, 24·8, 39·4, 26·4, and 64; and untreated, 32·2, 30·9, 24, and 49·2.

ANDREWS (L. K.), GOTTSCHALK (F. W.), & JOHNSON (J. P.). **Service records for Wolmanized lumber.**—*Proc. Amer. Wood Pres. Ass.*, xxxvii, pp. 54–80, 12 figs., 1941.

Two tables of service records for timber treated with Wolman salts [*R.A.M.*, xix, p. 249] in the United States from 1925 to the date of writing are presented, the data in (1) being summarized by years, species of wood, average preservative retention, volume, and removals, and (2) by individual installations. Of the total of 21,475,079 board ft. treated (of which 13,299,708 ft., or 61·8 per cent., had given 10 to 15 years of service), only 0·2 per cent. was removed on account of decay.

SCHMITZ (H.), BUCKMAN (S. J.), & VON SCHRENK (H.). **Studies of the biological environment in treated wood in relation to service life. I. Changes in the character and amount of 60/40 creosote-coal tar solution and coal tar and the decay resistance of the wood of Red Oak crossties after three years of service.**—*Proc. Amer. Wood Pres. Ass.*, xxxvii, pp. 248–297, 3 figs., 3 diags., 1 graph, 1941.

In this study, the first of a projected series bearing on the biological environment in treated wood in relation to service life, an investigation was made of the chemical and physical characteristics, after three years' service on the Chesapeake and Ohio Railway, of four red oak [*Quercus* spp.] sleepers impregnated by the Lowry process with net absorptions of 3 to 4 gals. 60–40 creosote-coal tar solution each, and four with comparable amounts of coal tar.

In both treatments, the most extensive changes were found to occur in the outer zones, with progressively slighter modifications from the exterior to the interior. There was a greater increase in specific gravity, and heavier losses both of the lower boiling fractions and tar acids from the bottom than from the top outer zone of the sleepers. The creosote-coal tar solution induced more striking alterations in the wood than the coal tar, an average of 17·3 per cent. of the former being lost from the top and bottom outer zones of the sleepers during the period of service compared with 9·2 per cent. of the latter. The toxicities of both preservatives extracted from the outer zones, gauged by their action on malt agar cultures of *Trametes serialis* and Madison 517 [? *Polyporus tulipiferus*: see preceding page], were much lower at the end of the test than at its inception, the decrease being sharper in the bottom than in the top zone. At the outset of the trials, the toxicity of the creosote-coal tar solution considerably exceeded that of the coal tar alone, but at the close of the three year period the two preservatives were about equal in this respect. Test blocks cut from seven of the eight sleepers were generally resistant to infection by *Lenzites trabea* and *Daedalea quercina* under optimum or suboptimum conditions for the growth of the fungi, the coal tar being as effective alone as with an admixture of creosote for the end in view.

In conclusion the writers discuss the ecological factors affecting the growth of fungi in treated sleepers, including water content, oxygen, inorganic nutrients, temperature, and (most important of all) the preservative itself. It is shown that the habitat offered to the organisms by the sleeper as a whole is quite different from that provided by the small test blocks into which it has to be cut for experimental purposes, and the changes in the various above-mentioned factors involved in such methods must be considered in an evaluation of the results.

WIRKA (R. M.). **Comparison of preservatives in Mississippi fence post study.**—*Proc. Amer. Wood Pres. Ass.*, xxxvii, pp. 365–379, 1941.

Notes are given on a large number of preservatives and other chemicals under test on wooden fence posts in the United States since 1937. No conclusions can as yet be drawn as to the relative effectiveness of the different materials in affording protection against decay, except that used crank-case oil and 10–90 creosote-used crank-case oil solution have proved ineffective.

HELPHENSTINE (R. K.). **Quantity of wood treated and preservatives used in the United States in 1940.**—*Proc. Amer. Wood Pres. Ass.*, xxxvii, pp. 410–432, 10 graphs, 1 map, 1941.

During 1940, 223 wood-preserving plants were in active operation in the United States [cf. *R.A.M.*, xx, p. 188]. Of these, 158 were pressure plants, 48 open-tank, while 17 were equipped for both methods of treatment. The total quantity of wood treated was 265,473,149 cu. ft., an increase of 20,253,271 cu. ft. (8·26 per cent.) over the previous year's figures. The consumption of creosote amounted to 174,625,305 gals., an increase of 10,761,046 gals. (6·57 per cent.) over the quantity used in 1939, while a rise was also reported in creosote-petroleum (64,370,186 gals., an excess of 13,741,223 gals., or 27 per cent., over the previous year). There was a reduction in the amount of pure zinc chloride of 731,517 lb. (over 37 per cent.), but the amount of chromated zinc chloride used (3,960,596 lb.) was 1,390,343 lb. (54 per cent.) in excess of the corresponding quantity for 1939. Decreases of 138,568 lb. of Wolman salts and of 14,233 lb. zinc-meta-arsenite were registered in 1940 as compared with the previous year. The quantity of celcure used (exclusively for open-tank treatment) in 1940 was 242,739 lb., this being the first year in which the salt has been recorded apart from other miscellaneous preservatives.

BOWEN (J. W.) & LOMBERG (B. R.). **The preservation of mining timber, with particular reference to the effect of air pressure, moisture content, initial vacuum and temperature on the absorption of preservative.**—*J. S. Afr. Inst. Engrs*, xxxix, 1, pp. 1–14, 2 diags., 7 graphs, 1940.

The following conclusions were drawn from an investigation at the Timber Research Laboratory of the Transvaal Chamber of Mines of the factors affecting the durability of underground timbers (*Acacia mollissima* and *Eucalyptus saligna*) treated with the so-called 'yard mixture', consisting of 3 per cent. zinc sulphate and 0·3 per cent. triolith [*R.A.M.*, xix, p. 269], the composition of which is given as 55 per cent. sodium fluoride, 35 per cent. sodium bichromate, and 10

per cent. dinitrophenol. Pressure was found to play a decisive part in absorption, the latter being directly proportional to the former up to 110 lb. per sq. in. The maximum air pressure available should be used at all timber preservation plants. Whenever extra durability is required, it is advisable to increase the time during which the timber is subject to pressure, the amount of preservative absorbed in 20 minutes, for instance, being only 82 per cent. of that taken up in an hour. No significant advantage was derived from the use of heated solutions for wood absorbing the preservative with comparative facility, such as *E. saligna*, for which the normal temperature of 20° C. is adequate. Buying specifications should contain a clause providing for the seasoning of timber for a reasonable period before dispatch to the mine, thereby substantially prolonging its effective life. *E. saligna* absorbs considerably more preservative than *A. mollissima*, but since the latter is more durable in the untreated state, little difference was found between the two as regards length of life after impregnation. An initial vacuum prior to the application of pressure greatly increases absorption, especially in timbers offering resistance to impregnation such as *A. mollissima*. For maximum absorption for mixed timbers the writers advocate 23 in. vacuum for ten minutes, followed by 110 lb. pressure for the same period. It is further recommended that, at appropriate intervals, a mixture of 4 per cent. zinc sulphate and 0·6 per cent. triolith be made up and applied to all timbers required for special purposes, which can then be stored until needed. The total cost of treatment (including labour and depreciation) of 1,000 cu. ft. by the new formula is estimated at £8. 3*s*. 2*d*., as against £5. 15*s*. 5*d*. for the original one; where zinc sulphate occurs as a waste product, however, the charge of £3. 4*s*. 5*d*. (£2. 8*s*. 4*d*. for the lower strength) for this item need naturally not be included.

A detailed description is given of two typical plant lay-outs and methods of operation, and a discussion following the paper is reported.

Proctor (P.). **Penetration of the walls of wood cells by the hyphae of wood-destroying fungi.**—*Bull. Sch. For. Yale* 47, 31 pp., 22 pl., 1941.

After stating that most wood-destroying fungi produce at least two types or sizes of hyphae, the small, actively-growing ones penetrating the cell walls without appreciable reduction in diameter, while, in the earlier stages of decay, the larger ones usually become constricted on contact with the cell wall, and effect the passage at a reduced diameter, with the result that the bore holes are frequently of approximately the same diameter, the author gives a full account of an investigation of the mode of hyphal penetration of plant tissues by wood-destroying fungi. The organisms used were *Fomes annosus*, *F. pini*, *Lenzites trabea*, *Polyporus schweinitzii*, *Poria weirii*, and *Trametes serialis*, and inoculations were made on *Pinus strobus*, *Tsuga heterophylla*, *Pseudotsuga taxifolia*, and *Thuja plicata*. Ultra-violet photomicrography with the 3650 A spectral line was used to record all observations, while the histological methods used were those preserving the natural conditions to the highest possible degree.

The evidence obtained showed that penetration of the walls of wood

cells is accomplished by (1) the secretion of enzymes at the tips of penetrating hyphae, and (2) the total, local dissolution of the cell wall by enzymic activity in advance of actual passage through the cell wall. Penetration is effected through a pre-formed passage without actual contact between the hypha and the penetrated cell wall, though contact with the cell wall at the first point of penetration may, possibly, stimulate initiation of enzymic activity. In every instance, the tip of the hypha was preceded by a cavity of significant proportions. Careful examination of hundreds of bore holes, in some cases with polarized light, gave no support to the view that mechanical force plays any part in penetration.

PALMER (J. W.). **Creosoting of poles. New and efficient method.**—*Aust. Timb. J.*, vii, 2, pp. 70–71, 2 figs., 1941.

Details are given of an economical new method of impregnating the entire sapwood of hardwood poles with creosote, experiments with which, in progress since 1934 at the Braemar State Forests, New South Wales, on spotted, grey, and red gum [*Eucalyptus maculata*, *E. tereticornis*, and *E. rostrata*] and grey box [*E. polyanthemos*], indicate the possibility of an added life of 33 per cent. or more. In brief, the method consists in fitting a rubber cap to the butt end of a pole, raised 3 ft. higher than the top, the creosote being admitted to the cap by means of a $\frac{3}{4}$-in. pipe, attached to a 5-gal. drum filled with the preservative and elevated 23 ft. above the ground. A pressure of roughly 9 lb. per sq. in. is thus obtained, the creosote being quickly forced through the sapwood from one end of the pole to the other. Impregnation of the pole is complete after six days.

Twentieth Annual Report of the Southern Forest Experiment Station January 1, 1940–December 31, 1940.—39 pp., [1941].

The following items of phytopathological interest occur on pp. 20–22 of this report. The best control of fusiform rust (*Cronartium fusiforme*) on slash pines [*Pinus caribaea*: *R.A.M.*, xx, p. 187] at a Brooklyn (Mississippi) nursery in 1940 was obtained by spraying with Bordeaux mixture 8–8–100 plus 1 pint santomerse (salt of a substituted aromatic sulphonic acid, in aqueous solution), two applications a week being given for a month from the appearance of the first uredosori of the rust on the alternate oak hosts in the vicinity, followed by one a week for the next month, all treatments ceasing on 3rd June, by which time the peak of sporidial production was past. A reduction in the incidence of infection from 13 to 1 per cent. was secured by this schedule. Other combinations tested, in descending order of toxicity to the pathogen, were Bordeaux mixture with (*a*) an emulsion of raw linseed oil and fish oil soap, (*b*) casein spreader, copper hydro with santomerse, and dry lime-sulphur with (*a*) santomerse, (*b*) casein spreader.

Constructional practices found to contribute to serious [unspecified] decay in wooden buildings in the southern United States included (1) the erection of dirt-filled porches with no protection for the sill behind the fill; (2) the use of untreated wood of low decay resistance in contact with moist concrete or soil or for exterior steps, rails, porch floors, and the like; (3) the presence of wood refuse under the buildings; (4) inadequate substructural ventilation; (5) rain seepage into open joints in exterior woodwork; and (6) leakage in roofs and plumbing.

Wood preservatives.—11 pp., Madison, Wisconsin, For. Prod. Lab., U.S. Dep. Agric., 1941. [Mimeographed.]

In this revised edition useful notes are given on a large number of materials used for timber preservation in the United States.

HASKELL (R. J.) & DOOLITTLE (S. P.). **Vegetable seed treatments.**—*Fmrs' Bull. U.S. Dep. Agric.* 1862, 16 pp., 4 figs., 1940.

In this useful bulletin recommendations are given for treating all kinds of vegetable seeds, roots, and tubers against various diseases, together with short directions for carrying out these treatments.

GREEN (D. E.). **Hygiene in the war-time vegetable garden.—IX. X.**—*J. R. hort. Soc.*, lxvi, 9, pp. 326–332, 2 pl. (preceding p. lv); 10, pp. 417–422, 6 figs. (between pp. lviii and lix), 1941.

These further instalments of the writer's series of instructions for the care of British war-time allotments [*R.A.M.*, xx, p. 506] include observations on a number of well-known diseases of onions and related crops [ibid., xx, p. 442], carrots, parsnips, scorzonera, and salsify.

WADE (B. L.) & ANDRUS (C. F.). **A genetic study of common Bean mosaic under conditions of natural field transmission.**—*J. agric. Res.*, lxiii, 7, pp. 389–393, 1941.

In field trials at Charleston, South Carolina, the behaviour of the F_1, F_2, and F_3 generations from a cross between the bean (*Phaseolus vulgaris*) varieties Stringless Black Valentine and U.S. No. 5 Refugee and the reciprocal indicated that the resistance of the U.S. No. 5 Refugee variety to common bean mosaic virus [*R.A.M.*, xx, p. 245] is dominant to the tolerance of Stringless Black Valentine (which showed a definite mosaic pattern and marked symptoms), and that a single factor is responsible for the resistance. There were no significant differences in genetic behaviour between the cross and its reciprocal.

PORTER (R. H.). **Seed-borne organisms and plant quarantines.**—*J. econ. Ent.*, xxxiv, 4, pp. 543–548, 1941.

In this paper, read before the Section of Plant Quarantine and Inspection, American Association of Economic Entomologists, at a meeting at Philadelphia in December, 1940, the author discusses from the following angles the interrelation of seed-borne organisms of fungal, bacterial, and virus origin and plant quarantines, with numerous illustrations of concrete examples: (1) the extent to which disease-producing agents are carried by seed; (2) the relative importance of determining the pathological condition of seed stocks in intra- and international commercial transactions; (3) methods for the detection of seed-borne organisms; and (4) the possibility and practicability of establishing proper facilities for the assistance of plant quarantine officials engaged in the regulation of seed commerce.

Service and regulatory announcements April–June, 1941. Plant quarantine import restrictions, Dominion of Canada.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 147, pp. 56–61, 1941.

A summary is given of the plant quarantine import restrictions obtaining in the Dominion of Canada.